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REPORT OF UNITED STATES STEEL CORPORATION.

The report of the United States Steel Corporation shows net earnings for the quarter ended Sept. 30 of \$36,764,643, and for the first nine months of the current calendar year of \$101,142,158. September earnings, which are given as \$11,750,000, are estimated. Earnings for the month of July were \$12,041,914 and for August \$12,972,729. Had it not been for inadequate transportation facilities, which prevented the corporation from making prompt shipments, the earnings for the quarter ended Sept. 30 last would probably have exceeded those of the preceding quarter. The inactivity of the mills of the American Tin Plate Co., due largely to the refusal of the workers to accept a reduction in wages in order to enable the company to bid for a portion of the re-export business, also cut down the income of the Steel Corporation. Taking into consideration these unfavorable factors the report can be considered a highly favorable one. For example the earnings of the quarter just closed exceed those of the corresponding quarter of last year by \$8,100,800. Then again the earnings of the combination for the first nine months of the current calendar year are within \$10,000,000 of the earnings reported at the close of the first twelve months of the corporation's operations. Judging from the earnings reported during the past six months the earnings for the second fiscal year, which ends March 31, 1903, will exceed President Schwab's estimate of \$140,000,000. Officials of the corporation declare that the improved showing in earnings has been due to the benefits derived through the carrying out of its policy of concentration, adoption of new methods of manufacture and reduction in operating expenses more so than increased production.

The following table shows the earnings by quarters since the corporation began operations:

First	\$ 26,363,840
Second	28,663,843
Third	29,759,913
Fourth	26,715,457
Fifth	37,662,058
Sixth (September estimated)	36,764,643
Total	\$185,929,754

The undivided profits for the nine months, applicable to increase "depreciation and reserve fund" accounts, for new construction or surplus, amount to \$34,647,982. This compares with undivided profits of something like \$24,000,000 reported in the first twelve months of the company's operations. Consequently the undivided profits at the present time must be in the neighborhood of \$58,500,000, a sum sufficient to pay dividends on the common stock at the rate of 4 per cent. a year for nearly three years.

The statement of the corporation and its subsidiary companies for the nine months ended Sept. 30 last follows:

NET EARNINGS.

1902.	
January	\$ 8,901,016
February	7,678,583
March	10,135,858
April	12,320,766
May	13,120,930
June	12,220,362
July	12,041,914
August	12,972,729
September (estimated)	11,750,000

Total net earnings after deducting, each month, the expenditures for ordinary repairs, renewals and maintenance of plants, also interest on bonds and fixed charges of the subsidiary companies\$101,142,158

Deduct amounts set aside for the following purposes viz:

Sinking funds on bonds of subsidiary companies.	467,540
Depreciation and reserve funds.....	10,306,565

Balance of profits for nine months applicable for United States Steel Corporation securities..... \$90,368,053

Deduct:

Interest on United States Steel Corporation bonds for nine months 11,400,000

Sinking fund on United States Steel Corporation bonds for nine months 2,280,000

Balance \$76,688,053

Dividends for nine months on stocks of United States Steel Corporation, viz:

Preferred, 5¼ per cent	26,790,258
Common, 3 per cent	15,249,665
Dividends on outstanding stocks of subsidiary companies	148

Undivided profits for the nine months applicable to increase "depreciation and reserve fund" accounts, for new construction or surplus \$34,647,982

The regular dividends were declared, both on preferred and common stock. The preferred is payable Nov. 15 and the common Dec. 30.

REAR ADMIRAL BOWLES' ANNUAL REPORT.

Along with all other work which has to do with iron the process of naval vessels under construction has not been satisfactory. This is the opening statement in the annual report of Rear Admiral Bowles which has just been presented to the secretary of the navy. On the Pacific coast, in addition to the non-delivery of steel, there have been strikes to delay the work. The delay in San Francisco amounted to ten months' work. The delay in the deliveries of armor for the battleships Maine, Missouri and Ohio, and the monitors Arkansas, Florida and Nevada has retarded the completion of these vessels concurrently with other causes. The inability of ship builders to obtain a sufficient force of skilled workers, also has been, in many cases, an important factor in the slow progress of the vessels. A table is submitted showing in concise form how the work on vessels under construction has fallen behind. For instance, the battleship Ohio is shown to have been twenty-nine months behind her contract on the first of July. This is not an isolated case. The battleship Missouri is over twenty months behind, the majority of the battleships and cruisers are over ten months behind, and some of the torpedo craft are more than forty months behind the date of completion stipulated in their contracts.

However, Admiral Bowles says that the extensive delays on the torpedo boats are being terminated by the newly modified conditions for their delivery. The contractors' delay in beginning the construction of the vessels of the Virginia, Pennsylvania and St. Louis class, the chief constructor points out, gave his bureau an opportunity to make a careful revision of the general plans of those war vessels, which, he says, will result in a considerable improvement in their military value and in their habitability. The plans for the turrets of the Virginia class were developed in more detail. An entire rearrangement of the scheme for the stowage of ammunition was made, and particular attention was given to an efficient scheme for coaling. A table is given showing the ships added to the navy during the past year. They were the battleship Illinois and the torpedo craft Decatur, Perry, Preble, Riddle, Thornton and Wilkes.

Substantial and encouraging progress is reported in the standardization of ship fittings, a scheme to secure uniformity in the innumerable types of ships' parts which has long been fostered by the construction bureau. Private ship builders having contracts for naval vessels from time to time during the year submitted plans for "standard" fittings, and now forty-four types of ship fittings have been declared to be standard. The bureau also has prepared type plans for ventilation and drainage for the vessels of the Virginia, Pennsylvania, St. Louis and Denver classes, and for the single-turreted monitors.

Admiral Bowles says there continues to be an urgent necessity for an increase in the number of officers of the construction corps. The principal navy yards, it is stated, have an insufficient number of officers for the performance of regular duties. This lack of officers is particularly hurtful just now in view of the construction of the big battleship Connecticut at the New York navy yard. Rear Admiral Bowles renews his recommendation for an increase of his corps from forty to sixty members.

The report says the advantages of special instruction in naval architecture and marine engineering in the United States became more evident last year. In contrast with the foreign technical schools to which students have been previously assigned, and the limited opportunities for practical work and observation of actual construction which the position of the students as foreigners naturally subjected them to, the bureau of construction is now enabled, by co-operation with the faculty of the Massachusetts Institute of Technology, to regulate the technical education appropriately and to offer the students and their instructors constant opportunities for observation of the building and repair of all classes of vessels, both at private ship yards and at the navy yards of the government.

SCOTTISH SHIP BUILDING LETTER.

Glasgow, Oct. 4.—The leading topics of interest in ship building and steel circles this week are the reported combine, about to be effected between John Brown & Co., Ltd., and Thomas Firth & Sons, Ltd., and the agreement concluded between the Cunard Co. and the government. In my last letter I told of the contract for a new battleship just booked by John Brown & Co., to be built at Clydebank. They, as well as Thomas Firth & Sons, Ltd., have extensive works in Sheffield. Both firms manufacture similar products, but the Firth company have considerable experience and plant for producing the forgings, tubes, and other component parts of guns, as well as projectiles, while John Brown & Co. build all types of warships and machinery at their Clyde yard. Firth's plant will, it is said, be very considerably extended for the production also of gun carriages and mountings which involve a very heavy plant. Armor plate is made at the Brown works at Sheffield, and the Firth works will in future supply the ordnance and mountings.

The firm of Thomas Firth & Sons, Ltd., was founded some sixty years ago and although it is now registered under the limited liability act, it is still a private business. They own the Norfolk Steel Works, Shot Forge, Clay Wheel Forge, West Gun Works, East Gun Works, foundry & File, Saw & Edge Tool Works, covering over twenty acres. In the East Gun Shop, with an area of 50,000 sq. ft., there is a 3,000-ton hydraulic forging press, and in it 40-ton forgings for the largest of gunshave been turned out, as well as marine shafts up to 30 in. in diameter. The overhead crane lifts 50 tons. The West Gun Shop is fitted with a large number of hammers ranging up to 30 tons each, and has a 100-ton overhead crane. The Firths were the first private manufacturers of ordnance, and the ingots for the once famous "Woolwich Infants" were cast from the steel made in about 1,000 crucibles by them. Their steel furnaces are of great capacity and have a 100-ton traveling crane for the casting of ingots. There is an oil-hardening tank for gun tubes, 75 ft. deep, holding 15,000 gallons of oil, which is served by a 50-ton swing crane. In the foundry castings of 38 tons are made, and armor-piercing and cast steel projectiles have been products of the company for forty years or more. The company have long been noted for their steel shafts, for their crucible steel, of which over 6,000 tons is made per annum, largely for cutting tools. The new combination, it is said, will be on much the same line as that of the Vickers-Beardmore alliance, and the result will be a third organization in this country capable of turning out a warship complete from the pig iron to the finished fighting machine ready for action with guns primed. These three are: The Armstrong-Whitworth Co. of Elswick-on-Tyne and Manchester; the Vickers-Beardmore combine of Glasgow, Barrow and Sheffield, and the Brown-Firth combine of Clydebank and Sheffield.

SHIP BUILDING RETURNS.

September has been a busy month with launches here, and the output of the Scotch ship yards has totalled thirty-three vessels of 58,000 tons, as compared with 46,900 tons in August and with 40,000 tons in September, 1901. The Clyde proportion was 53,000 tons, the Forth, 1,870 tons, and the Tay and the Dee turned out the remainder. The total was, of course, swollen by the two cruisers launched from the Royal navy—the Donegal by the Fairfield company and the Berwick by William Beardmore & Co., these together representing 19,600 tons displacement. Other large items were a steamer of 8,000 tons launched by John Brown & Co. for one of Sir Christopher Furness' lines; a 6,300-ton boat launched by Wm. Denny & Bros. for the British India line; a 4,000-ton boat launched by A. & J. Inglis for the same line; and a 4,150-ton boat launched by Russell & Co. for the Larrinaga Line. In addition to these there were three vessels of between 2,000 and 3,000 tons each, two between 1,000 and 2,000, three between 500 and 1,000, and about a score of vessels under 500 tons each, such as coasters, fishing vessels, tugs and barges. The output represented a great deal of work and it brings up the total for the nine months to 396,600 tons, or about 1,000 tons above the record of last year at same date. The character of the work turned out, however, is not indicative of any real improvement in trade. And the new contracts booked during the month will not exceed 35,000 tons, including the 16,350 tons of the new battleship to be laid down at Clydebank, a 4,500-ton boat to be built by Wm. Denny & Bros. for Patrick Henderson & Co.'s line, a 3,000-ton boat to be built for French owners by the Grangemouth & Greenock Dockyard Co. and some smaller craft.

Sometimes good comes out of evil, and at all events it is an ill wind that doesn't blow good to somebody. Thus the Russian shipping subsidies are bad enough, but at least one British firm of ship builders has no reason to complain of them. A new line of steamships is about to be established between Russia and the Tyne. Orders for three powerful steamers, fitted with refrigerating plant and accommodation for emigrants have been given to a firm on the Tyne, and the new line will be inaugurated in the first week in November. There will be a weekly service, summer and winter, the boat arriving each Sunday, with Finnish butter and other produce. This trade at present goes to Hull, but Newcastle is the nearest port to the Baltic. The line will be controlled by the Nord Steamship Co. of Finland, whose headquarters are at Helsingfors, and will be subsidized by the government of Russia. Without the subsidy it would not pay, and the British firm would not have got the orders for the steamers. Then, again, the French ship building bounties do not prevent orders from being sent from France to our ship builders.

The Grangemouth & Greenock Dockyard Co. has just received an order from French owners for a first-class cargo steamer to carry 3,000 tons deadweight with a high rate of speed. She will be fitted with 'tween decks, side ports, extra ventilation and commodious accommodation for service in hot climates. She is intended principally for the Danube trade, and will be fitted with all modern appliances for economy and efficiency. Engines of large power will be supplied by Cooper & Greig, Dundee, but the vessel will be built at the company's Greenock yard.

We do not build only fighting ships for the navy on the Clyde. The other day H. M. S. Creole, built and engined by Bow, McLachlan & Co., Ltd., Paisley, passed her trials. The Creole has been designed and built for special government service at Bermuda as a water-tank and fire-boat vessel, fitted with elaborate arrangement of tanks and pumping installation, and a very powerful fire engine. The speed and power trials were very satisfactory the power indicated and speed obtained being much in excess of requirements. In addition to the usual speed and power trials, the special pumping installation and the fire engine were also proved, and also gave complete satisfaction to the representatives of the admiralty. After her trials the Creole sailed for Devonport dock yard.

With reference to what has been said in previous letters about the boiling of our new warships it will be interesting to mention that the Fairfield Ship Building & Engineering Co. has contracted to supply the Durr boilers required for the first-class cruiser Roxburg, which is to be built by the London & Glasgow Ship Building Co., Ltd. The Fairfield company are sole licensees for Great Britain for the Durr boilers. The Orient liner Ormuz, built at Fairfield in 1886, is to undergo an extensive overhaul, and for that purpose she will be brought from London to the builders' yard in the course of this month. Then Williams & Robinson, Ltd., Rugby, have received admiralty orders for Niclausse boilers for two more first-class cruisers (Carnarvon and Devonshire), making four of this class in all, and more recently Niclausse boilers for a new battleship have been ordered, thus bearing out the previously expressed expectation that the merits of this boiler must soon receive fuller recognition. All these boilers aggregate about 100,000 H. P.

One of the oldest iron ship building yards in the country is that now owned by Palmer's Ship Building & Iron Co., Ltd., at Jarrow-on-Tyne, and it made a profit of £89,924 for the year ended June 30 last. The output of the company during 1901, which was its jubilee year, reached the total of 61,016 tons, the largest in any year of its history. These figures, however, do not cover repair work or the re-engining, re-boiling and re-fitting of war vessels, which has been a great feature of the company's work during recent years. In 1889 the average tonnage of their ships was 2,309, but last year it was 7,627. The chairman has just warned the shareholders that while the output last year was a record one, they could not shut their eyes to the fact that the demand for new tonnage has fallen off and that a period of comparative depression has arrived. The price of ships has fallen from 10 to 15 per cent. but there has been no alteration in wages, and workmen are receiving at present as high a rate of wages as had ever been paid in the annals of the ship building industry. He feared that in these circumstances there was not much chance of owners being tempted to build, and it was for all workmen, as well as builders, to consider the line of action which should be taken to enable us to maintain against the world our historic position as the great ship building power. Referring to government work entrusted to the company, the chairman observed that they had received the Medea and the Medusa to fit with new boilers and the Howe to overhaul. They had also secured from the admiralty orders for five new torpedo boat destroyers of the improved type, making twenty-one vessels of that class, which had been ordered from the company for the British navy in the last few years. The fall in the price of steel, amounting to 10s. per ton during the year, has not been accompanied by any reduction of consequence in the price of raw material. Wages also were still relatively high. On the other hand pig iron was high, and the result was that it was impossible to make steel at a profit. Owing to the appliances they had put down, the company were reaping considerable advantage. He did not think that they could expect to make much money out of steel during the current year. They had rebuilt one of their furnaces on the most recent American principle, and expected it to produce as much iron as two of the older type of furnaces. Palmer's company are iron smelters and steel makers as well as ship builders.

WORLD'S WASTAGE OF SHIPS.

Although at the present rate of ship building we are adding about 1,000,000 tons per annum to British registered shipping, there is a large annual wastage all over the world. During 1901 the gross reduction in the effective mercantile marine of the world amounted to 806 vessels of 662,568 tons, not including vessels of less than 100 tons. Of this total, 268 vessels of 366,584 tons were steamers, and 538 of 295,984 tons were sailing vessels. This exceeds the average of the previous ten years by 5,079 tons in the case of steamers although the number is thirteen below the average; as regards sailing vessels, it is below the average by 260 vessels and 70,465 tons. The figures relating to British tonnage are below the average by 46,000 steam and 4,600 tons sail, respectively. Apart from vessels broken up, condemned, etc., the United Kingdom steam tonnage lost during 1901 is below the average of the preceding ten years by about 40,000 tons, while the tonnage owned has increased during that period by nearly

4,000,000 tons. Strandings and kindred casualties, which are comprised under the term "wrecked," are, according to Lloyd's statistics, much the most prolific cause of disaster. To such casualties are attributable 46 per cent. of the losses of steamers and 42 per cent. of the losses of sailing vessels. The next most common termination of a vessel's career is by breaking up, nearly 19 per cent. of the vessels removed from the merchant fleets of the world being accounted for in this manner. Of the remaining causes of loss, collision is the most general for steamers (13.5 per cent.) while, for sailing vessels, cases of abandonment at sea are about 12 per cent. Cases of abandoned, foundered, and missing vessels may, perhaps, be regarded as more or less similar in the circumstances of loss. If these be taken collectively, they comprehend 16 per cent. of the steamers and 31 per cent. of the sailing vessels removed from the mercantile marine during 1901. Great as the absolute annual loss of vessels belonging to the United Kingdom appears to be, it forms a very moderate percentage of the mercantile marine of the country, and compares favorably with the losses sustained by other leading maritime countries. The merchant navies which exceed a total of 1,000,000 tons are those of the United Kingdom, the British colonies, the United States of America, France, Germany, Italy and Norway. Of these countries, the United Kingdom and the British colonies show the smallest percentage of loss, viz: 1.71 and 1.86 per cent. respectively of the vessels owned; Germany is 2.41 per cent.; and Norway is the highest with 4.83 per cent. Of steamers, while the percentage for the United Kingdom stands at 1.10, the average of the percentages of loss for the other six countries is 1.51. Of sailing vessels the percentage of loss for the United Kingdom is the same as the average percentage for the other six countries, namely, 4.17. These percentages do not include cases of breaking up, condemnation, etc., not consequent upon casualty or stress of weather. Steamers have a much greater immunity from disaster than have sailing vessels. The losses of steamers belonging to the chief maritime countries of Europe and to the United States of America amount only to 1.31 per cent. of the number and 1.19 per cent. of the tonnage owned, while the losses of sailing vessels reach 1.05 per cent. of the number and 4.3 per cent. of the tonnage.

QUESTION OF SUBSIDIES.

Without waiting for the report of the committee on shipping subsidies Sir Spencer Walpole, K. C. B., has issued a pamphlet on the subject. He argues that unless we are prepared to say that Great Britain is entitled to a monopoly of the carrying trade of the world, and that no other nation has a right to compete with her on the ocean, there is nothing in the position of her trade to justify alarm. On the contrary, the statistics afford ample ground for saying that the rapid expansion of our mercantile marine has far exceeded any reasonable expectations, and affords the best justification of the policy of freedom under which it has grown to its present proportions. Thus the whole excuse for any legislative interference disappears. The experience of other nations in granting subsidies to shipping is not encouraging. That experience confirms, in his opinion, the impression that a policy of subsidies does not lead to large profits. On the contrary, the subsidy relaxes instead of strengthens individual effort. The extent, moreover, of our own trade makes a policy of subsidies impossible. No nation could bear the cost of subsidizing a marine whose tonnage exceeds 15,000,000 tons. The obvious impossibility of doing so has driven the advocates of subsidies into recommendations that the subsidies should be paid only on particular branches of trade or on particular classes of vessels. The subsidy, if it had any effect at all, would divert vessels from a more profitable to a less profitable trade. By conferring an advantage on a particular kind of vessel it would place competing lines at a disadvantage. If, for example, a subsidy was given to exceptionally fast vessels sailing to New York, it would make it more difficult for other steamers, either with passengers or cargo, to hold their own on that route. For the sake of encouraging a service of some convenience and luxury, the subsidy would help to destroy a much larger and much more valuable industry. In this opinion Sir Spencer Walpole is not supported. The protectionists suggest confining trade between British ports to British bottoms. They seem to forget, he says, that there are two interests concerned in this matter; (1) the shipping interest, naturally in favor of dear freights, and (2) the manufacturing interests equally naturally desiring cheap freights. The manufacturing interests secure its object by the existence of competition. The shipping interests would have the manufacturers at their mercy if competition was withdrawn. Men in India, for example, already complain that a great line of steamers has secured too much of a monopoly of the eastern trade. How greatly would those complaints increase if the Peninsular & Oriental Co. was no longer subject to the competition of the French Messageries and the North German Lloyd by foreign vessels being prohibited from trading with British goods to British ports. Subsidies paid to steamships for the carriage of mails are payments for work done, and are not really subsidies. If a government engaged in a great commercial business like the post office finds it necessary to transmit some bulky mail matter on specified dates by specified routes, and at specified rates of speed, there is no more objection to it paying a steamship company for the service than there is in paying the North Western railway for carrying mails to Scotland. But such payments, provided that they bear a reasonable relation to the work to be done, are in no sense subsidies. It is unfortunate that they have ever been known as such for their existence under this name encourages the notion that subsidies are in certain cases

justifiable. Sir Spencer Walpole is right in some of this, but his argument in reference to India does not apply to the real coasting trade and moreover even in the Indian trade the competition between British ship owners would always be enough to keep down rates.

The agreement between the Cunard Co. and the government of which you will have received particulars by cable, involves payment of an annual sum of £150,000 to be paid to the company in return for services to be rendered to the government and the holding of the whole fleet at the disposal of the government when occasion arises. This is not a bounty but a payment for service in excess of what the company needs to provide as a commercial enterprise. The company is to build two large new boats of greater speed than any now on the Atlantic, and the government will advance the money at $2\frac{3}{4}$ per cent. for repayment in annual installments over twenty years. This is a better bargain for the Cunard company than Mr. Morgan made in the case of the White Star, for he has to pay 5 per cent. interest. Here-with the ship building world is much enlivened at the prospect of two new Cunarders contesting for the blue ribbon of the Atlantic.

A phenomenal development of the last few days has been the charter of a steamer to take 5,000 tons hard coal (of anthracite character) from Glasgow to New York. Such a thing has not happened within my memory. It is, of course, one consequence of the Pennsylvania strike, which has sent so many orders for iron over here. Quite a number of steamers will be required to take across from the Clyde and Tees, the Mersey and Cumberland all the pig iron that has been bought for America within the last week or two.

SHIP BUILDING AT NEWPORT NEWS.

Newport News, Va., Oct. 15.—The new Old Dominion liner Monroe, building at the yard of the Newport News Ship Building & Dry Dock Co., will be launched Saturday morning about 9:30 o'clock and will be christened by Mrs. Andrew Jackson Montague, wife of the governor of Virginia. Pres. Guilleaudet of the Old Dominion Steamship Co., will come down from New York on Friday with a large party of guests, using one of the steamers of his fleet. A number of outside guests have been asked to witness the launching, which promises to be a notable event. Following the launching, a luncheon will be given in honor of the sponsor by the ship building company at Hotel Warwick. The Monroe will be one of the handsomest ships in the coastwise service and will cost in the neighborhood of \$800,000 when completed.

The Siberia, second of the new Pacific mail leviathans to be built at the ship yard, is complete and ready to sail for San Francisco around the Horn as soon as the owners say the word, and as soon as coal can be secured with which to take her there. It will require more than 3,000 tons of coal to carry the Siberia as far as Montevideo, which will be her first stop for fuel, and even though sufficient coal could be procured for this voyage there is no certainty that she will be able to get coal at Montevideo because the supply there comes from the United States. The coal question here is one that is worrying everybody. The ship yard manages to get sufficient from the Chesapeake & Ohio railroad to continue operations, but the electric railways and other industries have only a few days' supply ahead and have little prospect of getting all of the fuel they need. The steamship St. Enoch, which loaded here, had to go to New York for bunker coal, because she could not be accommodated here, at Norfolk or at Baltimore.

A syndicate of shipping men in this vicinity has hit upon a novel idea of securing coal from the bottom of Hampton Roads and in the harbors of Newport News and Norfolk around the coal piers. These men propose to dredge for coal that is known to be somewhere on the bottom. They have already secured purchasers for all the bituminous coal they can recover at \$9.50 a ton. Work will start off Ocean View where the coal barges Volunteer and Mystic Belle went down about eighteen months ago, loaded with New River coal. A large number of ships have gone down in the Roads in the past few years, coal laden. In this connection the question of ownership of the coal has been raised, but the syndicate is not letting this cause any delay and will begin operations at once.

Preparations are being made at the ship yard to begin active work on the construction of the battleship Louisiana. As this yard is virtually competing with the government and cannot afford to consume more than the contract time in building the ship, there will be no delay. Orders are already being placed for material and the draughting force is setting out the plans. The ship yard is now on its metal and something out of the ordinary may be expected in the Louisiana.

According to the present plans of the navy department, the battleship Texas, which is now in dry dock at the navy yard having a year's growth of seaweed and barnacles removed from her bottom preparatory to repainting, will go in commission Nov. 3. The ship will re-enter service with a new battery of 6-in. casemated guns, quick-firing, which are now ready to be placed aboard. The old battery of 6-in. guns will be sent to Washington to be converted into rapid-fire ordnance. The Texas will join the North Atlantic squadron in time for the winter maneuvers.

The United States auxiliary cruiser Prairie, temporarily in service as a transport, is coaling and taking on supplies preparatory to sailing for Panama with 500 marines, who have been aboard for a week.

ENGLISH SHIP BUILDING LETTER.

London, Oct. 4.—The event of the week has undoubtedly been the official announcement as to the relations existing between the British government and the Morgan combine upon the one hand, and the arrangements entered into upon the other hand between the British government and the Cunard Steamship Co. There can be no denying the fact that this announcement indicates a profound change in national policy. To be sure, the protection of the British mercantile marine has, for at least three centuries, been the object of parliamentary concern. I have been trying for some time past to prepare some notes showing the influence of legislation upon the growth of ship building and shipping, and I hope before long to transmit the result of my work in this direction to the readers of the Marine Review. But this is not a case of legislation aiming to conserve or modify shipping policy. It is an actual attempt on the part of the British government to control and participate in shipping activities. Over here, we have been much struck with President Roosevelt's speeches upon trusts and his general conclusion that the state must in some degree control them. In this instance, the British government has gone one step further than your president, for it has frankly stepped down from an attitude of *laissez faire*, and is now an undoubted participant in shipping enterprise. The actual terms of the arrangement are set forth in a letter issued by Lord Inverclyde to the shareholders of the Cunard company. I expect you have ere now received by cable the general terms of the agreement. It is, however, perhaps well to put on record the actual terms of the agreement so far as they have now been made public. The terms are shortly as follows:

1. The Cunard company are to build two large steamers for the Atlantic trade of high speed.
2. The agreement is to remain in force for twenty years from the completion of the second of these vessels.
3. The Cunard company pledges itself until the expiry of the agreement to remain a purely British undertaking, and that under no circumstances shall the management of the company be in the hands of or the shares or the vessels of the company held by other than British subjects.
4. During the currency of the agreement the Cunard company is to hold at the disposal of the government the whole of its fleet including the two new vessels and all other vessels as built, the government being at liberty to charter or purchase all or any such vessels at agreed rates.
5. The Cunard company also undertakes not unduly to raise freights or to give any preferential rates to foreigners.
6. The government are to lend the money for the construction of the two new vessels, charging interest at $2\frac{3}{4}$ per cent. per annum. The security for the loan is to be a first charge on the two new vessels, the present fleet, and the general assets of the Cunard company.
7. The Cunard company is to repay the loan by annual payments, extending over twenty years.
8. From the time new vessels commence to run, the government are to pay the Cunard company at the rate of £150,000 per annum, instead of the present admiralty subvention.

Ship owners will appreciate the far-reaching importance of this agreement without any further comment from me, and I will therefore at once proceed to state, as far as I know it, the understanding arrived at with Mr. Morgan. The best way to do this is to quote the *ipsissima verba* of Gerald Balfour, the president of the board of trade, who made the announcement at the Cutlers' Feast in Sheffield on Tuesday, Sept. 30. After commenting upon the agreement with the Cunard company in a speech which was listened to with breathless attention, the minister proceeded:

TERMS OF THE AMERICAN AGREEMENT.

"Now I come to the agreement made with the Atlantic shipping combine. I have already indicated that it was not unnatural that the public should see in the Atlantic shipping combine a design of injuring British shipping and British commerce. I say such conclusion, having regard to all the circumstances, was not an unnatural one for the public to form. While I say that, I feel bound to add an expression of my firm conviction that no such design ever entered into the mind of Mr. Pierpont Morgan. Mr. Pierpont Morgan is a great believer in the principle of large trusts. He may be right, or he may be wrong—on that I express no opinion whatsoever. But he is a great believer in the principle of trusts, and he also considers that the conditions of the Atlantic shipping trade were such as to make that principle peculiarly applicable. With true American decision he proceeded to apply it, but I am quite certain he had no intention whatever of injuring the commerce or the shipping of this country, and the proof is the readiness with which he has met the government in all those points in respect of which British interests might seem to be most endangered by the fact that this shipping combination had been formed. Well, we made an agreement with Mr. Morgan, and the general effect of that agreement is to secure that the British companies in the combination shall remain British, not merely nominally, but in reality British, that those companies shall be kept alive, and a majority, at least, of their directors shall always be British subjects. The agreement further provides that every British ship, every ship now flying the British flag, and every ship hereafter built for the combination, shall continue to be a British ship and shall continue to fly the British flag, that it shall be officered by British officers, and manned in reasonable proportion by British crews. In other words, those companies those British companies, are to remain to all intents

and purposes British companies, while the British government on its side undertakes that they shall continue to be treated, as heretofore, on a footing of equality with other companies in respect of any services, whether postal or military or naval, which his majesty's government may require from the British mercantile marine. As regards future construction the combination has undertaken that at least half the tonnage hereafter built for the combination shall be built for the British companies, and shall continue to fly the British flag, and be in all respects British vessels. And a provision has further been added enabling his majesty's government in the event—which I trust will not be realized—of the combination pursuing a policy hostile to the British mercantile marine or hostile to British trade, to terminate the agreement into which they have entered."

THE LEGAL AND FINANCIAL SIDE OF THE BARGAIN.

A good deal of interest is evinced as to the power of the Cunard directors to pledge themselves that the shares of their company shall be held only by British subjects, which is one of the points agreed upon with the government. Clause 3 of the agreement, I have stated, stipulates this without reserve. On the face of it, it would seem that the articles of the Cunard association must be altered, for as things are now, the directors possess no power to veto transfers of shares. As originally drafted, the articles empowered the directors to reject any transfer at their absolute discretion, without assigning any cause, but subject to an appeal to an extraordinary general meeting. Later these provisions were rescinded, and the Cunard board at present can only decline to register transfers of shares on which they have a lien. The shares possess the voting power, and the voting power, of course, carries the control. It is incumbent upon the directors to prevent the shares getting into the hands of or under the influence of other than British subjects. The question now is, how is this to be done? In the first place, there are, or were until recently, foreigners among the Cunard shareholders. If they refuse to sell the directors have no means to compel them to do so. But this is not important, as the holdings are small. But suppose when a shareholder dies, he leaves his shares to an only daughter. The daughter marries, say an American, and in consequence American influence, if not American holding, becomes an accomplished fact, notwithstanding the agreement with the British government. But the wife dies, and in the course of nature her son, an American citizen, inherits the shares. If he refuses to transfer the shares at the directors' bidding, it is doubtful even if new articles were framed to cover such a contingency, whether it would be legal. Or again, an Englishman may become a naturalized American citizen, but his shares still continue to be his property. Thus, either they would have to be confiscated, or some machinery devised specially for this purpose. But on general grounds a still more insuperable objection may be urged. Articles of association are, after all, only rules framed for the efficient management of the concern, and are in no sense the law of the land. Thus, even if the members of the Cunard company agree to regulations that the directors shall not sanction a transfer of shares to an American, Dutchman, German or Frenchman, the shareholders may submit to it, and all is well. But the company would have to undertake at least to obtain a purchaser for any shares any member may wish to sell, and at a price fixed according to scale. But if the shareholder should say, "No, here is an American or German willing to give me much more for my shares, and I shall sell to him unless you are prepared to give me the same price," what can the directors do? Can they legally prevent the transfer, notwithstanding the terms of the articles of the association? Of course, whilst it would appear on the face of it to be legally impossible for the Cunard company to prevent foreigners, and particularly Americans, from becoming shareholders, it is comparatively easy to provide that the management of the company shall always be in British hands. These difficulties, whilst not serious enough to invalidate the agreement, yet indicate clearly enough how that the practice of company law has developed without the slightest idea of government intervention or special arrangements and agreements made with the government.

IS THE BARGAIN A GOOD ONE?

And now comes the question, Is the bargain a good one? I think we must all agree that the Cunard company has been well paid for keeping out of the Morgan combine. To have money advanced to them at $2\frac{3}{4}$ per cent. payable by easy installments in twenty years, and to receive a subvention of £150,000 annually instead of £28,000, is quite good enough to go on with. Of course it is generally recognized that the fast ocean liners to be built will be run at a loss. Experience teaches that you cannot run a large American liner at anything over 22 knots without sacrificing valuable cargo, and so losing something on each voyage. I am quite prepared to believe that when the loss is computed upon these two fast ocean liners, it will cut a big hole in the annual subvention of £150,000. It is important to note that Gerald Balfour, the president of the Board of trade, expressly disavows any principle of subsidy, that is, subsidy in the terms of a letter I sent to you two months ago. On this point Gerald Balfour says (referring to the annual subvention), "This sum may perhaps appear at first sight somewhat a large one, but I can assure you that the point has been most carefully considered, and we have come to the conclusion that this sum is not more than a fair remuneration for the services to be rendered. To the principle of paying a subsidy in excess of the remuneration fairly due to the services rendered by any shipping

company the government are firmly opposed. Such subsidies we regard as merely bounties in disguise, and to the principle of giving bounties we are resolutely opposed."

THE AGREEMENT IS POPULAR.

Of the popularity of the agreement there can be no question. Two or three of the keener critics prefer to wait for fuller details, and when parliament meets in a fortnight's time, many searching questions will be asked. One or two have already expressed the opinion that the Cunard gets a great deal more than it gives. But the man in the street has, without compunction, expressed complete satisfaction. The average opinion is expressed in a leading article in the Times, from which I quote as follows: "It will generally be felt, we think, that the agreements into which the government has entered with the Atlantic shipping combination and with the Cunard company, are wise and rational. Some people will, perhaps, continue to look with a jealous eye on the power of American capital over the carrying trade of the Atlantic. Some economical purists will, no doubt, protest against the loan and the subsidy, by which the Cunard company is to be strengthened in its position as a purely British undertaking, though Mr. Gerald Balfour explains that they only amount to what is needed to make the construction of the new fast vessels not a losing venture. But the policy of the government will be judged by most people from a practical point of view. Certain points in these agreements may be open to criticism, and as a matter of course we shall have plenty of critics in the field. In the arrangement with the Cunard company the stipulation that the shares shall never be held 'by other than British subjects' appears to be futile. Foreign capitalists can surely if they are so inclined, hold any amount of such shares under cover of British nominees. But the matter is, after all, a small one, and the provision, if it does no good, can hardly do any harm. With regard to the combination, it is important to remember that the interest of the American capitalists in the security and freedom of the Atlantic carrying trade is a powerful guarantee for the food supplies of the United Kingdom in the event of war. A foreign enemy would think twice and thrice before attempting to intercept our food supplies, as soon as it was realized that the result would be to engage in an additional quarrel with interests that are very powerful in the United States. It should be added that the agreement with the combination is to last, like that with the Cunard company, for twenty years, but in the former case is to be renewable for periods of five years. If, however, the combined companies should be found to be pursuing a policy of hostility to the mercantile marine or the commerce of this country, the British government reserves the right to terminate the agreement."

GROWTH OF IRON AND STEEL INDUSTRIES.

An exhaustive report on the manufacture of iron and steel has just been completed by William G. Gray, acting as expert special agent of the census bureau. The report does not deal with the consolidation of concerns known as the United States Steel Corporation because it had not been consummated in the census year. It is valuable, however, as showing the status of the iron and steel business just before this immense corporation was exploited. The statistics in the report relate only to establishments which operate blast furnaces, rolling mills and steel works, iron ore forges and pig and scrap iron bloomeries. A comparative statement is first given showing that while the number of establishments has decreased from 808 active and idle in 1870 to 669 active in 1900, the capital invested has increased from \$121,772,074 in 1870 to \$590,530,484 in 1900; the number of wage earners from 77,555 in 1870 to 222,607 in 1900; the wages paid from \$40,514,981 in 1870 to \$120,836,338 in 1900; the cost of materials used from \$135,526,132 in 1870 to \$522,431,701 in 1900, and the value of the products from \$207,208,696 in 1870 to \$804,034,918 in 1900. During the thirty years under review the tonnage of pig iron, steel castings, rolled products, hammered blooms, etc., increased from 3,263,585 gross tons in 1870 to 29,507,860 tons in 1900. Comparing the leading details for 1900 with those for 1890, we find a decrease in the number of active establishments of fifty, an increase in the capital invested in active establishments of \$176,485,640, and an increase in the average number of wage earners of 51,426. The number of men, sixteen years of age and over, increased 50,962; and the number of women, sixteen years of age and over, increased 1,013, but the number of children under sixteen years of age employed shows a decrease of 279. The miscellaneous expenses increased \$14,059,152 in 1900 over 1890; the cost of materials, \$195,158,856; and the value of products, \$325,347,399. In quantity the products increased in the same period 13,243,382 tons. Of the total capital reported for active establishments in 1900, namely, \$590,530,484, Pennsylvania contributed \$321,985,659, or considerably over one-half, as compared with \$226,294,407 in 1890 (total, \$414,044,844), still over one-half, and \$102,956,223 in 1880 (total, \$209,904,965), a little less than one-half. The average number of wage earners employed in the whole country in 1900 was 222,607, who were paid wages amounting to \$120,836,338. Of these totals Pennsylvania gave work to 110,864 wage earners, almost one-half of the total reported, paying them \$61,908,405, or over one-half of the wages paid in this industry in the United States. Of the total capital invested in 1900, Ohio, which ranks second in the manufacture of iron and steel reported \$86,477,552 as compared with \$37,642,887 in 1890 and \$22,807,606 in 1880.

The average number of wage earners reported was 22,677 in 1900, 23,546 in 1890 and 20,071 in 1880, the wages paid to these workers amounting to \$10,730,469 in 1900, \$13,262,141 in 1890, and \$8,265,070 in 1880. The cost of materials, including freight charges, was \$91,329,307 in 1900, \$44,551,301 in 1890, and \$23,997,915 in 1880. The value of the products amounted to \$138,935,256 in 1900, compared with \$65,206,828 in 1890 and \$34,918,360 in 1880. The increase in capital invested in 1900 over 1890 was \$48,834,665, and over 1880 it was \$63,669,946. Illinois, which was third in importance in 1900 in the manufacture of iron and steel, had capital invested in that year to the amount of \$43,356,239 in 1800 compared with \$34,689,919 in 1890 and \$5,705,620 in 1880. The average number of wage earners employed in 1900 was 16,642, compared with 8,685 in 1890 and 5,253 in 1880. The value of the products amounted to \$60,303,144 in 1900, \$39,011,051 in 1890 and \$20,545,589 in 1880. In the decade from 1800 to 1900 a large number of consolidations of iron and steel establishments were effected. During the census year 1900 there were fourteen companies which owned or operated 136 blast furnaces with an annual capacity of 11,550,000 gross tons of pig iron, or over 54 per cent. of the capacity reported for the whole country; seven companies which had forty-one Bessemer steel converters with an annual capacity of 8,000,000 tons of steel ingots or castings, or over 69 per cent. of the total capacity; twelve companies which had 142 open-hearth furnaces with an annual capacity of 3,370,000 tons of steel ingots or castings, of over 59 per cent. of the total capacity, and nineteen companies which had 158 rolling mills, with an annual capacity of 16,418,000 tons of rolled and forged iron and steel products, or over 60 per cent. of the total capacity. A comparative summary of the capital invested in active, idle and building establishments (including rented property), as returned at the census 1880 to 1900 inclusive, is given. Idle establishments embrace all plants which were not in operation during the census years enumerated, but which were in good condition and could be readily put into operation. Establishments which at one time were engaged in the manufacture of iron and steel, but which were not likely to resume operations, are not included in this table

Classes.	Year.	No.	Capital.
Active	1900	669	\$ 590,530,484
	1890	719	414,044,844
	1880	792	209,904,965
Idle	1900	94	18,368,032
	1890	119	12,369,058
	1880	200	18,939,988
In course of construction	1900	34	6,266,757
	1890	34	4,091,678
	1880	13	2,126,931
Total.....	1900	797	*615,165,273
	1890	872	*430,505,580
	1880	1,005	230,971,884

*Includes rented property valued in 1900 at \$17,245,413; in 1890, at \$8,291,058.

The total production of all kinds of iron and steel in 1900 amounted to 29,507,860 tons, compared with 16,264,478 tons in 1890 and 6,486,733 tons in 1880. The increase in 1900 over 1890 was 13,243,382 tons, or 81.4 per cent., and the increase in 1890 over 1880 was 9,777,745 tons, or 150.7 per cent. Compared with 1880 the increase in 1900 amounted to 23,021,127 tons, or 354.9 per cent. The increase production of 1900 over 1899 was more than twice the total production of 1880 and the total production in 1900 exceeded by 6,756,649 tons the combined production of 1890 and 1880. These figures graphically exhibit the wonderful growth of the iron and steel industry during the last twenty years.

SHIP BUILDING IN THE BATH DISTRICT.

A review of ship building in the Bath customs district during the nine months of the present year gives the total amount of tonnage sent overboard as 21,975. This is a falling off of over 4,000 tons from the corresponding term in 1901. The decrease is attributed to the coal strike, which has diminished profits during the year considerably. Following is a summary of the principal vessels launched during the period mentioned:

Rig and Name.	Masts.	Tonnage.
Ship Atlas	4	3,381.00
Sch. Prescott Palmer	5	2,811.00
Sch. Lizzie M. Parsons	4	655.00
Sch. Kate Feore	3	382.71
Yacht Pantooset	2	538.00
Barge Cienfugos	4	1,915.00
Barge Santiago	4	1,918.00
Sch. Cora F. Cressey	5	2,499.00
Tug John G. Chandler	0	100.00
Str. Ransom B. Fuller	0	2,000.00
Sch. Fairfield	3	564.00
Sloop Marion	1	83.27
Str. Norumbega	0	100.00
Sch. Alice M. Davenport.....	3	589.00
Sch. Margaret Ward	4	1,074.00
Sch. Samuel P. Bowers	4	626.00
Sch. Frank W. Benedict	3	534.00
Sch. Madeline	3	463.00
Sch. Fred A. Davenport	4	746.00
Barge Charles K. Nichols	4	280.00

NEWS OF THE GREAT LAKES

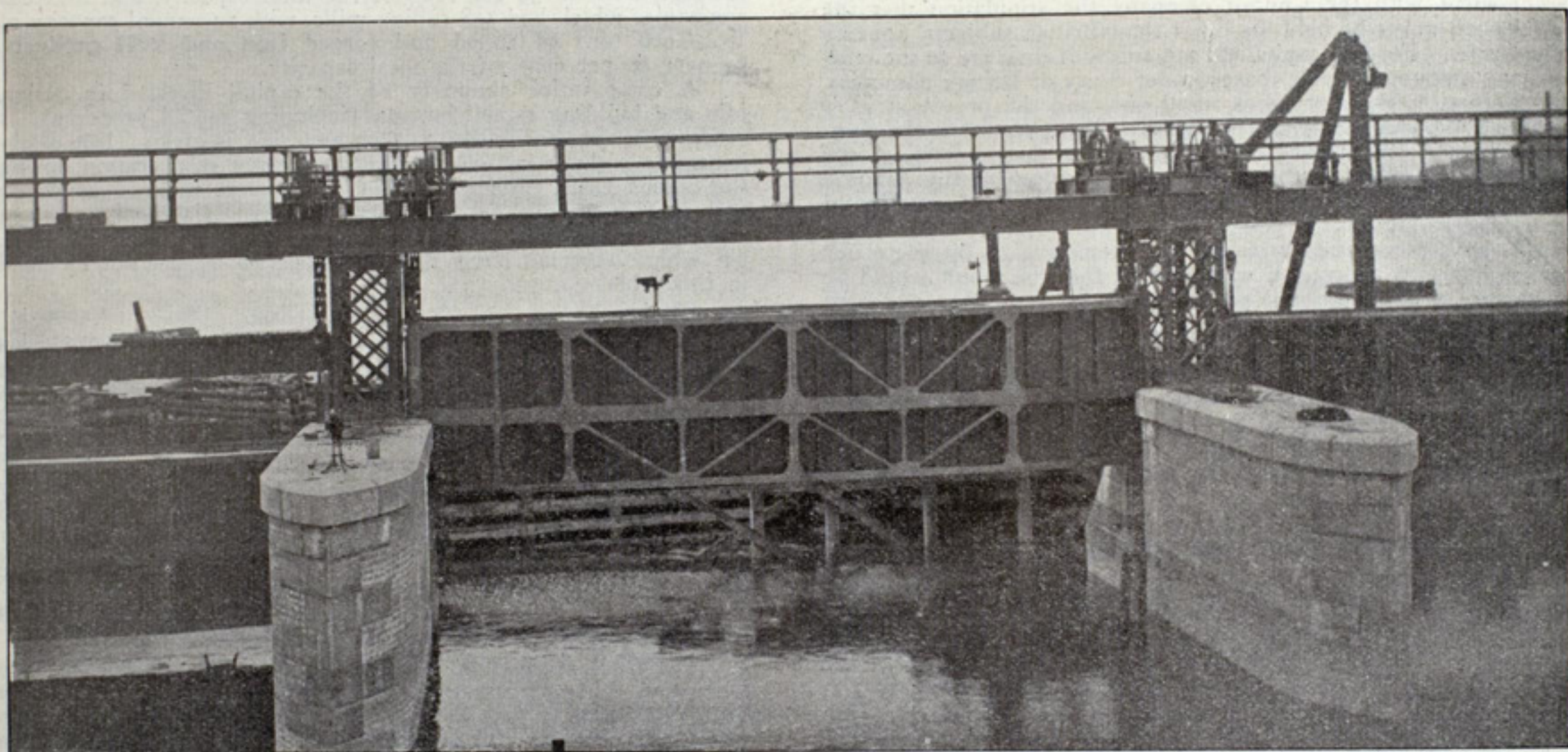
TO STOP FLOW OF RIVER RAPIDS.

Compensating Works in St. Mary's river designed to stop as much of the flow as will be carried off by the Power Canal.

Sault Ste. Marie, Mich., Oct. 15.—With the completion of the great water power development at this place, and the actual use of a great volume of water in the new canal shortly for power purposes, vessel men will be interested in the compensating works, a portion of which have been finished, and which are designed to stop as much of the flow of the rapids as will be taken through the power canal. The importance of these compensating works is not confined to the special purpose for which they were built here. Leading engineers claim that they really pre-

Here the water is deeper and the rock ledge river bed more regular than in other parts of the rapids. As far as completed the works consist of four "Stoney" sluice gates arranged between masonry piers and abutments, erected on the rock ledge.

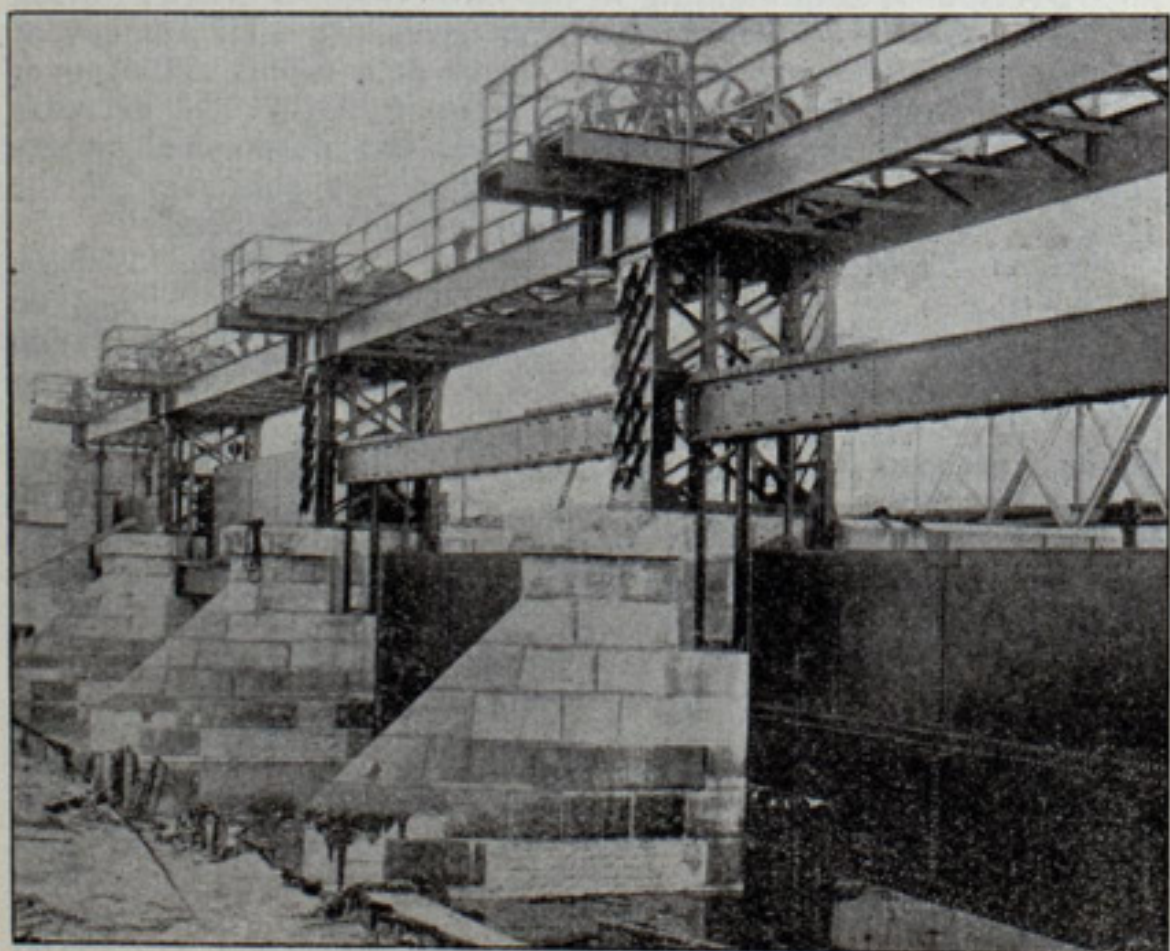
Construction was begun in August of last year, first by framing and locating at various distances above the rapids stone-ballasted timber cribs to serve as anchorages for tugs, scows and other construction plant; then a railroad siding was built from the main tracks of the Canadian Pacific road to the edge of the rapids, skirting the same and passing under the bridge. A break-water about 1,000 ft. long of ballasted timber cribs was built from the shore partially across the river close to and above the site, and a cofferdam of square timber frames lined with timber



Compensating Works at the Sault—View of gates from International Bridge.

sent the first step toward conserving such conditions of all lake levels as are now recognized to be essential to the future welfare of the shipping interests.

The compensating works are represented by three views presented herewith. They are located at the head of the Sault rapids above the International bridge, near its northerly end and abreast of the ninth span of the bridge from the American shore.



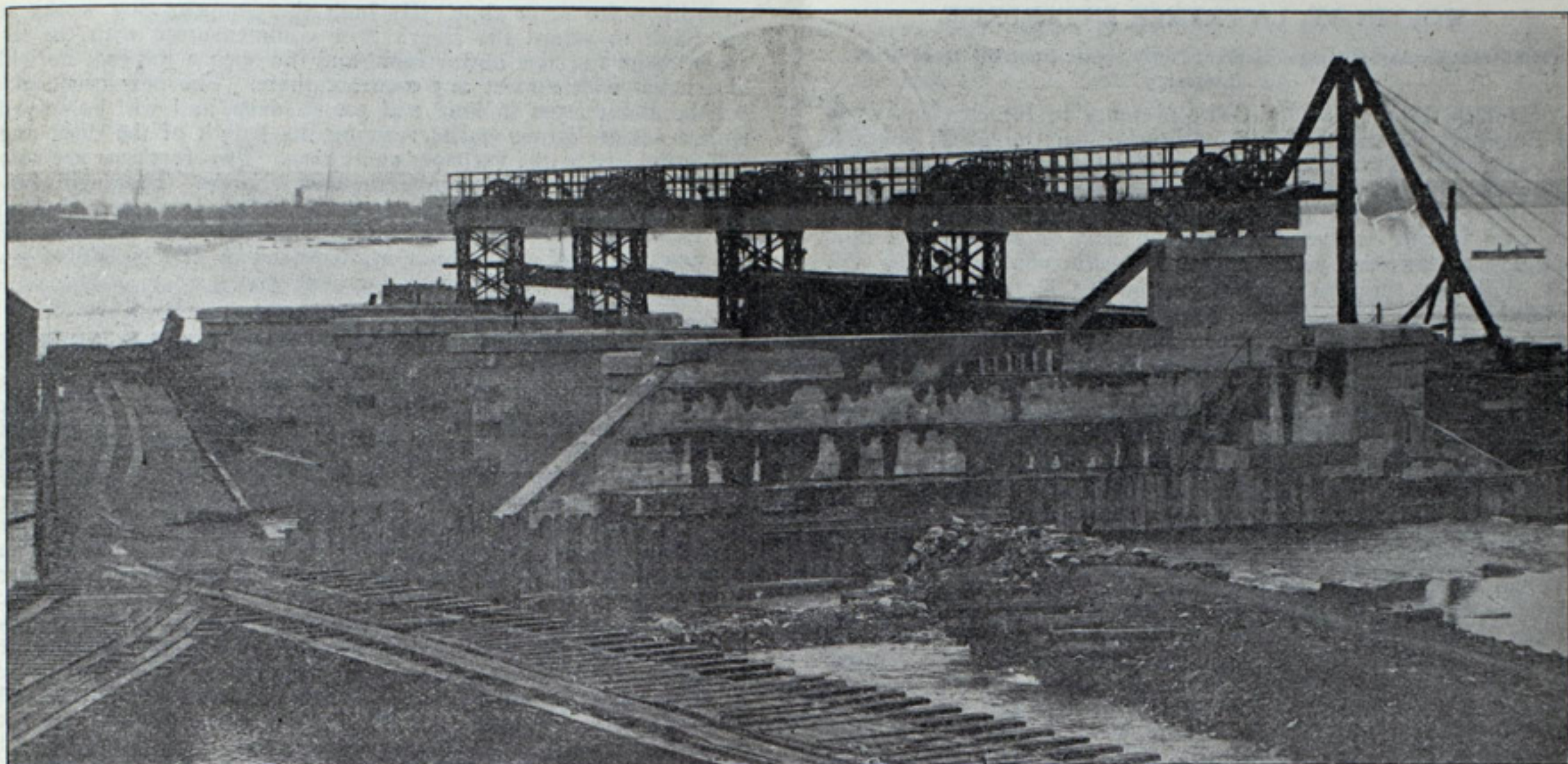
Compensating Works at the Sault—View showing gates and counter-weight boxes balancing the gates in front.

sheeting and filled with sand was constructed around the location of the sluices.

After pumping the water from the cofferdam area the bed rock in the enclosure was excavated about 10 ft. deep and the space refilled with a monolithic concrete mass anchored to the lower and firmer rock stratas. When this was accomplished, by December last year, it was decided to continue operations during the winter, and in order to do so the cofferdam was housed and a heating and lighting plant installed. The piers and abutments were erected inside of this house of monolithic concrete faced with granite paving blocks and granite and limestone blocks for quoins and cut-waters, the floors between piers being paved with granite blocks. By the end of the winter, in April of this year, the masonry-part of the structure was completed, the house dismantled and the erection of the steel gates begun. The entire structure was completed in June of this year and the operation of the gates has been frequently witnessed since.

The gates are each 48 ft. long and 15 ft. high, of steel frame and sheeting, suspended by sprocket chains from shafts coupled to gearings installed on an operating bridge on top of piers, a steel counter-weight box of the length of the gate being suspended from the other ends of the sprocket chains on the upstream face of the gate. They stand in recesses of the piers, resting with down-stream faces of ends against live roller trains secured to the piers. The operation consists in raising or lowering them vertically by means of the gearing apparatus, their weight being overcome by the counter-weights and the friction caused by pressure of flow of water against their up-stream faces by the live roller trains. When lowered they practically stop all flow of water and they can be raised to their full height in about six minutes.

As already stated, these sluices are part of the compensating works which it has been decided are required to guard against any interference with the natural condition of Lake Superior by reason of creating a new out-flow through the power canal. The remaining portion of the works will be "submerged dams" about 500 ft. long, the construction of which is now in progress, and



Compensating Works at the Sault—North view of end.

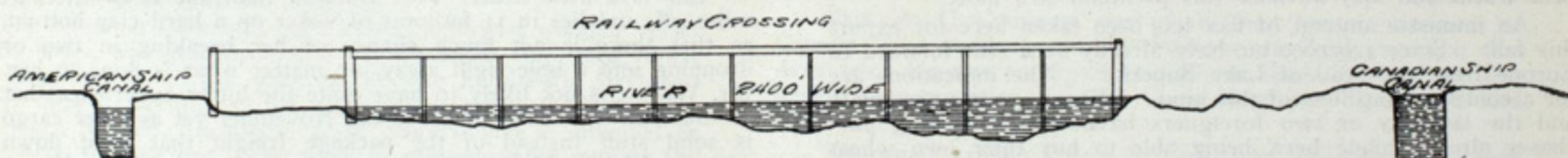
when they are completed it is expected that these works will afford full compensation, that is, as much water will be prevented from going over the rapids as will be carried around them by way of the power canal.

Lake Superior has an area of about 30,000 square miles which is fed by the rain fall on the lake proper plus the run-off from its drainage basin, about 53,000 square miles. The outflow represents the supply less evaporation, and is approximately from 60,000 to 110,000 cu. ft. per second, the low water prevailing principally during the closed navigation season.

Figures relating to the quantity of water required for one lockage through the present American and Canadian ship-canals show for the Poe lock, 1,520,000 cu. ft.; for the Weitzel lock, 735,000 cu. ft.; for the Canadian lock, 1,140,000 cu. ft. It is also figured that if these three locks were operated to their maximum capacity night and day, with additional allowance for leaks and water used to generate the operating power, they would require about 1,400 cu. ft. per second, which is less than one-fiftieth of the mean discharge, and this during navigation season only, about two-thirds of the year. The tonnage which would pass through the locks, in the present type of lake carriers, if operated at the

about 10,000,000 tons of good ore, mostly Bessemer, running about 62 per cent. iron. The mine is very wet, making from 4,000 to 4,500 gallons of water per minute, but there is a pumping plant capable of handling 8,000 gallons and there was recently installed a fine cross-compound Corliss condensing Prescott pumping engine handling 5,200 gallons. By this they have brought their cost of water down to about 5 cents per ton of ore on the amount they have been able to mine, about 250,000 tons per year. The new owners take possession immediately and expect to increase the output materially, though this has been found difficult. The mine is in the northeast quarter of the southwest quarter of section 1 T. 57 R. 2, and will continue to pump all the water for the Hibbing basin till the new Elizabeth mine is down to a considerable depth. O. B. Warren, who has been in charge for the Union Steel Co., at its Volunteer property, Marquette range, will have charge of the Penobscot and has already taken hold. Mr. Warren was assistant superintendent at the Mahoning Ore & Steel Co.'s mine and explorations till about a year ago.

No prices are given out in reports of the transfer but it is understood that the vessels went in upon a basis of \$315,000 each.



The relative size of the river and ship-canals at Sault Ste. Marie.

greatest capacity, is figured approximately at 70,000,000. The relative size of the river and the ship-canals is shown in a diagram herewith. It is well to note, however, that flow through ship-canals occurs only at the period of lockage.

It is expected that the power canal just completed will divert about 30,000 cu. ft. per second from the flow of the rapids. This is a very large item but there will still be an immense volume that could be used for power development and which the owners of the present works are planning to use without interference, they say, with the operation of the locks. They say that as far as navigation interests are concerned, there really does not seem to exist any objection to developing all the power the Sault rapids will yield, provided an ample quantity of water remains available for locking purposes and the compensating idea is carried out to offset diversion, and provided all water withdrawn is returned to the St. Mary's river below the rapids.

SALE OF PENOBSCOT MINE AND SHIPS.

The Union Steel Co. of Pittsburg, one of the so-called independent concerns, has greatly strengthened its position by the purchase of ore property and a couple of large steel steamers from Eddy Bros. of Bay City, Mich., who have been prominent for a great number of years past as lumbermen and vessel owners. The purchase is made in the name of the Donora Mining Co., which is the ore division of the steel company. H. C. Frick and the Mellens of Pittsburg are identified with the steel company. The ore property entering into the transfer is on the Mesabi range and includes the Penobscot mine. The steamers are the Simon J. Murphy and Howard L. Shaw. The mine contains

The Murphy and Shaw were built for the Eddy-Shaw fleet and came out in 1900. They are both modern steel freighters and are practically of like dimensions, being 435-ft. keel and 51-ft. beam. The price paid for them is, with one or two exceptions, the highest price ever paid for a lake freighter. It is probably \$50,000 more than they would cost to build, even at the present high rate of vessel construction. But the steel company desired immediate possession and this meant special value in the use of the ships, as they could not get new vessels until the spring of 1904, on account of the crowded condition of the ship yards.

The war department has consented to the revision of the specifications for the construction of the breakwater at Cleveland as amended by Maj. Dan. C. Kingman and new proposals have accordingly been solicited from the contractors. When the bids were submitted some time ago it was found that they were far in excess of the appropriation and that while the sum involved was over \$2,000,000 only three firms contested. The contractors claim that the specifications were too arbitrary. Maj. Kingman has now amended them to permit the core of the breakwater to be packed with sand instead of slag and gravel, and to permit the use of stone of varying sizes to be used in building the breakwater. Bids are now asked upon the specifications as originally drawn; and also upon them as amended. It will then be determined whether the modifications had better be adopted.

The name of the steamer George G. Hadley has been changed to W. P. Rend, after her owner.

WOLVIN ST. LAWRENCE ENTERPRISE.

Northwest Grain Situation—General News Items from the Head of the Lakes.

Duluth, Minn., Oct. 15.—The presence in the city this week of Mr. J. P. Gordon, manager at Quebec for the Great Lakes & St. Lawrence Transportation Co., directs attention to the St. Lawrence enterprise on which Mr. A. B. Wolvin and associates have been at work for some time past. This is the line for which ten steel freight steamers of Canadian canal dimensions are now building at different yards of the American Ship Building Co. Mr. Wolvin is the general manager and Mr. Gordon was here in conference with him. He was also here to look after the shipment of the last section of a cargo of 270,000 bu. consigned from here to Liverpool and taken down the lakes by the vessels of this fleet, to be loaded on the steamer Minnetonka at Quebec, for delivery at destination. It took six cargoes of the "canalers" engaged in the lake end of the service to load the Minnetonka. This is the first cargo of the kind that the Great Lakes & St. Lawrence company has taken through, but it is hoped that a large trade will be worked up. It would seem that for the present at least the Minnetonka and her sister ship Minnewaska are to be operated on the Atlantic in connection with the St. Lawrence service of the Wolvin syndicate. It will be remembered that these two large tramp steamers were built by the American Ship Building Co. at the Globe works, Cleveland, sent down to tidewater in two sections and there put together for ocean service. The venture thus far seems like a losing one, both for builders and owners, namely on account of the marked decline in ocean freights that occurred about the time the vessels were completed. Nothing could be found for the Minnetonka to do after being put together at Quebec and she has been idle for at least a couple of months past. On the second steamer, Minnewaska, the loss has not been so great as she was paid for giving up her right to the dry dock at Quebec so that a big repair job might be hurried on a steamer that was badly needed for special service. When the Minnetonka and Minnewaska were ordered from the American Ship Building Co. it was thought that Charles E. & W. F. Peck of New York were largely interested. It would seem now that the interest of the New York house was not very large, as they are out of the management altogether. Mr. Wolvin is president of the company that owns the two lake-built tramps.

It looks as though there would be no wheat in store at the head of the lakes at the close of navigation. There was a decrease last week and now there is a further and larger decrease this week of about 80,000 bu. This, coming at the time of year when receipts are at their best, is without precedent. The receipts are large, but there is a tremendous demand for grain. Shippers and elevator companies are hungry for it. They are keeping close tab on receipts and follow each car as closely as they can. Mills are large buyers daily and will be grinding very heavily to the close of navigation and perhaps longer. Last week's receipts amounted to 2,500,000 bu., and there were shipped, together with local mill consumption, 2,573,000 bu. Flax and barley stocks here are now each practically as large as wheat. Shippers are now paying $2\frac{1}{4}$ cents premium over December for cash wheat and may advance this premium still more.

An immense amount of flax has been taken here for export this fall. Some 1,350,000 bu. have already been sent forward to Europe from the head of Lake Superior. The indications are for a continued business of this kind. Wheat exports are small, and the last day or two foreigners have been cancelling purchases already made here, being able to buy their own wheat cheaper.

The steamer City of Paris arrived here on Sunday with a cargo of hard coal, the second since spring. Dock laborers for the Northwestern Fuel Co., to which the cargo was consigned, refused to unload the boat unless they were given the privilege of buying one ton of coal each, and this was not denied them. The boat was unloaded Monday and the cargo distributed to the company's retail offices in Duluth, Minneapolis, and St. Paul. The sales were made at the old price of \$7.50 a ton, one ton to a customer, as long as the coal lasted. This is an indication of the situation here now, and of the demand for fuel. The Fuel company might easily have asked \$10 a ton for this coal, but adhered to the ante-strike price.

The Lake Superior Contracting & Dredging Co., the united Upham and Barker fleets, is doing a lot of work in preparation of its new yards and docks at the old Barker site, West Superior. Large offices and docks will be erected and warehouses and machine shops built. The company will maintain headquarters at Duluth but have its work done at Superior.

T. E. Putnam, organizer for the International Brotherhood of Steam Shovel & Dredge Engineers & Cranemen of America, has been at the head of the lakes for some days organizing the local men into a branch of the union. It is also his intention to organize the steam shovel operators of the Minnesota and Michigan mining regions, and it will be interesting to note how the mining companies will look at this step in unionizing their men. They have so far been able to keep union organizations out of the mines, and the men there are getting the best pay and have the best care of workmen anywhere.

At the Sault, H. E. Talbott & Co. have the contract for erecting large steel and concrete ore receiving docks for the Algoma Steel Co., an enterprise independent of, but connected with, the Lake Superior Power Co. Mr. Talbott was chief engineer for the Michipicoten road and has been identified with the Clergue

enterprises for some time. He built the compensating works at the Sault to retard the river's flow commensurate with the increase from the new power canal and did such a job that he will be trusted with almost any contract there. The new ore docks will be about 2,500 ft. long and 300 ft. deep, and will be served with a set of Brown hoists running the length of the dock and delivering ore to the furnaces at its rear. Two furnaces are now nearly completed and will be in blast shortly. They will furnish hot metal to the converters.

Between 6,000 and 7,000 piles will go into the foundation of the new ore dock to be built at Escanaba by the Northwestern road. The dock will be ready for next year.

RECOVERING THE STEVENS' CARGO OF COPPER.

Buffalo, Oct. 14.—The final wind-up history of the Union Transit liner W. H. Stevens and her treasure cargo of copper does not promise to be quite as long drawn-out and fruitful of newspaper articles as was that of the old steamer Pewabic, which lay a matter of forty years in the bottom of Lake Huron, only to be discovered and robbed of her cargo when modern wrecking and diving appliances were sufficiently improved, but there is for all that a very interesting story of the work on the Stevens up to date and it may be added to quite materially before the copper is all afloat.

I am personally a trifle sorry that the Stevens was found so soon after she was lost. There were so many opportunities for creating a veritable gold mine out of the Pewabic and so many of them were elaborated by good newspaper men and true, all endowed with Artemas Ward's "Rekesit Imaginashun," that it is really doing them an injustice to be able to turn the burned steamers cargo into unromantic money the very first season of her going down. The Stevens has been on the bottom of Lake Erie about an even month and already there has been a wrecking expedition hanging over her for weeks, sallying out vulture like from the Canadian harbor of Port Purwell every quiet day to dig after her copper. She was first reported afloat by the steamer Topeka on arrival here the second day after she burned. Most people said there was a good pipe dream getting an airing; but there were soon more reports to the same purport and in a few days D. H. Wilcox, a veteran Buffalo insurance agent and wrecker, with a few such bad jobs as the Western liner Idaho to the credit side of his ledger, was looking after her. On his first trip to Erie, as the American port nearest to the wreck, he failed to locate her and the New York insurance man who had come up to see about paying the loss went home without seeing her. There were soon further reports of her and though it was not supposed that she was within 31 miles of Presque Isle light, as it proved later on, Mr. Wilcox was soon in touch with an honest fisherman or two, who knew just where she was and proposed for a consideration to give her into his hands. It seems that there were plans on the part of certain fishermen to lose the boat a few times and find her again, also for a consideration, but the precaution was taken the first time she was sighted to obtain some good compass lines on her from several directions, so that in case she is not taken care of this fall and the buoy on her is carried off, she can be located pretty exactly in the spring.

She is a little nearer Port Burwell than she is to Erie, 23 miles off, and lies in 11 fathoms of water on a hard clay bottom, so that there is not much chance of her breaking in two or dropping into a hole right away, no matter what is done to her. Mr. Wilcox is not likely to have quite the bitter experience that he did with the Idaho, for it is not November yet and her cargo is solid stuff instead of the package freight that went down with the Idaho. His divers are not expected to see the bodily or ghostly faces of any men who were lost with the Stevens, for there was nobody lost and it turned out that all they saw on the Idaho were imaginary, but they saw them all the same.

The Stevens expedition consists of the little schooner Eliza Allan, a staunch lumber and stove-bolt hooker, and the necessary diving outfit. Experience has taught the master of the expedition that a boat of that size, about 100 ft. long, is a better wrecker than a larger one, as she can be held firm with kedge anchors in any water that a diver can operate in, while the larger boat will move about in quite a small sea. So far the work has been very unsatisfactory. Up to last Friday, when Mr. Wilcox was last in Buffalo, he had raised only a matter of 8 tons of the copper, but he is very confident of getting it all this fall, as he estimates that it will take him only about ten good days to do the work. As her flaxseed and flour are worthless and mostly out of the way and her decks are burned off it is quite easy to get to her. Still it has been very rough of late, and the little schooner has had scarcely anything to do but wait.

They say that Port Burwell is not exactly a metropolis to stop in and that the poor sailors have had to invent all sorts of amusement to keep them from stagnating, so if it turns out that the natives do not conclude after they are gone that they are all Sunday school boys nobody needs to wonder. They have assisted in saving over \$50,000 worth of copper and have done well.

JOHN CHAMBERLIN.

Plans have been made by the city engineer of Cleveland for radical changes in the part of the big Superior street viaduct that is immediately over the main river. The plans include a lift bridge structure over the river instead of the swing now operated at that point. This would be a great improvement from a vessel standpoint as it would do away with the center pier obstruction on which the swing rests.

FALL FREIGHT OUTLOOK.

The movement of northwestern grain by lake from Duluth is thus far not a matter of great satisfaction to lake vessel interests. The season is now so far advanced that there is not much hope of high fall freights. A possible spurt in grain may come with the last few weeks of the season, but even this is doubtful. If it were not for the very urgent demand that still exists for everything in iron and steel lines, and the consequent enormous movement of iron ore, the close of the lake season of navigation would be very tame. Furnaces are demanding all their ore, notwithstanding the difficulties under which it is being moved on account of inadequate railway facilities and crowded storage space. It is this great demand for ore and the delay to which vessels are subjected that has maintained the freight rates. Thus we have proof in another season that there is far more vessel capacity than could be used to advantage if the railways and terminals were fitted to keep the lake fleet fully employed. It is more than probable that even with the best of the big steel freighters the returns as to earnings will be disappointing this year on account of delays in port, and some of the small vessels must have been operated almost at a loss, in view of their inability to secure coal cargoes for return trips and the many days which they spent in port waiting for coal after being chartered.

It would seem that after all some vessel owners are inclined to overestimate the importance of the fall grain movement as a factor in lake freights. Grain shipments from the head of the lakes in October and November during four years past were:

1898 shipments for October and November...32,000,000 bu.

1899 shipments for October and November...22,000,000 bu.

1900 shipments for October and November...12,000,000 bu.

1901 shipments for October and November...25,000,000 bu.

Convert this grain for the year of largest shipments, 1898, into tons and we have approximately 850,000 gross tons which is a very small item compared with this year's output of about 25,000,000 gross tons of iron ore.

LAKE SHIP YARD MATTERS.

The Dunkley-Williams Co., operating a line of vessels between Chicago and South Haven, has for some time past been figuring with the Craig Ship Building Co. of Toledo and the Jenks Ship Building Co. of Port Huron, for a fast passenger steamer, a 20-mile boat to have about 100 state rooms, as well as a large number of cheap berths below cabins. The vessel would have very little space for freight, as the principal freight business of the line is in the carriage of fruit. The plans, which are as yet preliminary, contemplate twin triple-expansion engines. It was announced from Chicago a few days ago, that the order had been placed with the Craig company, but it is quite probable that the matter is not yet fully settled. If the order goes to the Craig company, the Toledo yard will be comfortably filled with work for some time to come, but in any event it is more than probable that both the Craigs and the Jenks company shortly have booked work enough to run them until next fall, as is the case with the American Ship Building Co.

The schooner Chieftain, said to be the largest wooden vessel on the lakes, was launched from the Davidson ship yard, West Bay City, last Saturday. She is the one hundredth Davidson vessel. She is 360 ft. over all, 47-ft. beam and 26 ft. deep. She has eleven hatches, all spaced 24-ft. centers, and is intended to carry 5,000 tons of ore. The work at present under way at the Davidson ship yard comprises a duplicate of the Chieftain and a large tug.

A quick repair job has just been credited to the Buffalo Dry Dock Co. The steamer Northern Wave entered dry dock Oct. 1, and on survey it was found sixty-three plates were damaged, twenty of which had to be renewed, thirty-three rolled and put back, and ten faired in place; twenty-five frames and floors were repaired and renewed. The steamer was floated out of the dock Oct. 10.

Repair jobs, some of them of considerable extent, have been under way all summer at the works of the Ship Owners' Dry Dock Co., Chicago. The steamers City of Rome and Neshoto are now at these works. Satisfactory progress is being made with the fire boat which the company is building for the city of Milwaukee.

FOUNDING OF THE C. B. LOCKWOOD.

The wooden steamer C. B. Lockwood, bound for Buffalo with a cargo of grain, foundered about 15 miles off Ashtabula during the terrific storm on Monday night. The cause of the disaster is not as yet known though every effort is being made to determine it. The steamer had not been making good weather and it was decided to lower an anchor and head into the sea. There doubtless had been some derangement of the machinery prior to this. The boat had not been riding at anchor long when the engineer reported to the captain that the vessel was filling with water. The engineer thought that a steam pipe had burst but could not get in to see. The firehold was fast filling with water and Capt. Saph ordered the members of the crew to take to the lifeboats. Capt. Saph and his wife and six members of the crew got into one boat; and the remainder of the crew, ten in number, under the direction of the second mate, got into the other boat. Capt.

Saph's boat was picked up on Tuesday morning by the big steamer G. J. Grammar, Capt. R. W. England, which was bound for Ashtabula for ore. They had been for twelve hours in the yawl with nothing but one oar to steer by and a woman's shawl to use as a sail. It was only by the most accomplished seamanship that the little boat was kept alive in the huge sea that was running. Those in the boat with Capt. Saph and his wife were Joseph Flaherty, first mate, Toledo; Mrs. Davis, cook, West Bay City, Mich.; George H. Hill, watchman, Bay City, Mich.; Levi Langel, calker, Marine City, Mich.; Robert Casten, wheelman, Milwaukee; K. Matson, wheelman; J. G. Wilson, watchman, Toledo. During the night Matson was washed out of the yawl but was picked up a little later by the other occupants. Tugs and patrols were sent out in search of the lifeboat containing the ten other members of the crew but no trace could be found of it. It was a staunch boat with room for twenty men. It is now feared that it foundered during the night. Joseph Flaherty, first mate, and a few members of the crew arrived in Cleveland on Wednesday and called upon Mr. Gilchrist. Mr. Gilchrist endeavored to ascertain from the mate the direct cause of the disaster. Mr. Gilchrist was under the impression that the anchor chains might have worked through the hawse pipes and opened up the hull but the mate said that the trouble was entirely aft. He was unable to give any testimony that might lead to a determination of the cause.

The Lockwood was built in 1890 by Quayle & Sons for B. L. Pennington and others. She was one of the last of the wooden steamers to be built in Cleveland. Mr. Gilchrist bought the Lockwood from Mr. Pennington two years ago for \$100,000. She was 285-ft. keel, 45-ft. beam and her gross tonnage was 2,323.

AROUND THE GREAT LAKES.

At an election of the new Grand Trunk car ferry line at Milwaukee the following officers were elected: President, E. G. Crosby; vice-president, Frank L. Vance; secretary, Max Krause; treasurer, William H. Meyer.

At a meeting of the directors of the Detroit & Cleveland Navigation Co., at Detroit Thursday, W. C. McMillan was elected president to succeed his father, the late Senator McMillan. He will also continue as general manager.

The dredge Sir Wilfred, built by the Polson Iron Works for the Pourpore Co. of Montreal, broke her boom 8 miles west of Port Hope last Wednesday and sank. She was the largest dredge of her kind ever built in Canada.

At the Stevenson iron ore mine, one of the largest of the open-pit Mesabi range properties, more than 16,000 tons of ore were loaded into cars in one day recently, two 105-ton shovels working in the ore against the face of a high bank.

A new coast chart No. 8, Lake Huron, in colors, showing the north coast of Lake Huron from Scammon Cove to Loughheed Point, including the north channel from Little Detroit to Sulphur island, has just been issued and may be had from the Marine Review.

Capt. A. C. Cameron, one of the best known mariners of Canada, died suddenly at his residence at Collingwood a few days ago. He was employed at different times by the Lake Superior Transportation Co., the Great Northern Transit Co. and North Shore Navigation Co.

The small steamer Owen, on Gull shoal, has been abandoned as a total wreck. The tug Donnelly was unable to save her owing to the seas. Richardson & Sons, owners of the wheat cargo of the vessel, lost \$3,000 by the wreck, as there was no insurance on the grain. The steamer was valued at \$5,000.

While discharging her cargo of grain at Meaford, Ont., it was discovered that the new steel steamer Kanawha had struck a sunken obstruction resulting in several of her steel plates being torn loose and a part of her cargo damaged. The surprising thing is that none of the crew were aware of the accident. It is supposed to have occurred at the Fullerton avenue bridge in the north branch of the Chicago river.

In its desire to increase the sleeping capacity of its boats the Graham & Morton Line has decided on a remodeling plan for the steamers Puritan and Soo City. The Puritan, which has just ended its season's work, will be remodeled as soon as possible. The space now occupied by the hurricane deck will be given over to staterooms, nearly doubling the steamer's sleeping capacity. The Soo City will be remodeled later.

Capt. James Stone, supervising inspector of steamboats for the ninth district, went to Buffalo last week to listen to an appeal taken by Capt. William Lund, of the steamer W. H. Wolf, from the decision of the local inspectors Pope and Schumacher, who suspended him for fifteen days as a result of a collision between the Wolf and the tug Alpha. Capt. Stone, after going over the evidence, approved the decision of the local inspectors.

It is not probable that Capt. W. H. Singer of Duluth will make much progress with his efforts to bring about a consolidation of certain lines engaged in passenger and freight business on the lakes. Any attempt to consolidate the lines owned by railway companies seems useless, and at least one very determined effort was made recently, without success, to bring about the kind of consolidation that Capt. Singer is attempting.

ERIE BARGE CANAL VS. ONTARIO ROUTE.

Maj. Thomas W. Symons, government engineer in charge of the Buffalo district, has sent to Engineering News an article discussing the Ontario route for a barge canal against the Seneca-Oneida-Mohawk route. As marine interest in this project is of the liveliest character it is herewith reproduced:

"After very careful investigation and consideration, the friends and advocates of an enlarged Erie canal, having all available facts before them, have decided that the route to be adopted for the proposed barge canal shall be through the interior of the state by way of the Seneca and Oneida rivers, Oneida lake and the Mohawk river, and not by the Lake Ontario route, and in a published statement gives reasons therefor. In Engineering News of Sept. 11, this selection was questioned, and an attempt was made to refute the statements and arguments used. I therefore beg the privilege of presenting again in a somewhat different form the reasons for selecting the interior route, and answering some of the published arguments and statements against it.

"In the first place, it may be stated that prior to the construction of the Erie canal, the Ontario route was for a hundred years and more the main traveled highway between the east and west. Its good and bad qualities, and all the points in its favor and against it were well known to our forefathers, when they decided against it, and in favor of a canal in almost entirely an artificial cut through the interior of the state. So the question is not a new one, being older than the Erie canal itself. As our forefathers wisely decided against the Ontario route, so today I believe the advocates of canal enlargement have wisely decided against it. I believe, too, that it can be stated with perfect confidence that the choice of routes receives practically the unanimous approval of every friend of the canals who is familiar with lake and canal navigation, and who is unhampered in his judgment. The advocates of the Ontario route are those who are unfamiliar with these questions, who have some local axes to grind, or those who, like the Engineering News, are avowedly opposed to the radical improvement of the canal on any route. It is, of course, very alluring to think that by adopting the Ontario route \$20,000,000 can be saved over adopting the interior route, and there must be strong reasons to justify its being turned down in favor of the more expensive route.

"The principal objections to the Ontario route are the following:

"(1) Boats, whether made of wood or of steel, must necessarily be made much heavier and stronger if they are to traverse the wide waters of Lake Ontario, than if they are to be confined like the ordinary canal boats of today to the narrow interior waterways. Of course, there probably would be boats built capable of going into the great lakes, but the vast majority of the business on the canal would certainly be done by canal boats built as cheaply and as light as practicable and suited to the narrow protected waterways. For the purpose of strengthening the argument that all canal boats would be practically alike and capable of navigating the lakes, the allusion by the Engineering News to the successful operation of fleets of steel canal boats running to Cleveland was unfortunate, as these boats have been found to be unsuccessful, and have been taken off the route, sold and taken out of the country. The perils and detentions due to navigating Lake Erie with them was undoubtedly the principal element to which their lack of success was due. The manager of the line felt this keenly, and once in conversation with the writer told him that he was seriously contemplating the construction of a huge steamer like a floating dry dock into which the loaded canal boats could be floated, the steamer then pumped out and the passage made between Cleveland and Buffalo, where the boats would be removed and then proceed about their business on suitable waters. It is my understanding that plans for such a vessel were prepared, but it was never built. The whole incident of these steel Cleveland canal boats illustrates very forcibly the practical difficulties of navigating the waters of the lakes and the canal by the same boats. There is nothing truer than that the highest economy demands that business should be done on the ocean, lakes, rivers and canals in vessels suited to the different types of waters.

"Now the practical objection to the heavier vessel for ordinary canal work is that every ton extra put into the construction of the boats means a ton less in freight-carrying capacity, as the size of the locks limits the size of the boat to a definite figure. A canal boat of the size proposed suited to lake navigation will exceed one suited for the canal alone, by about 100 tons, and hence every trip the lake boat is handicapped by its inability to carry within 100 tons as much as the canal boat proper. With a fleet of four boats this would mean 400 tons each way.

"The Ontario canal route would therefore have at least 10 per cent. less carrying capacity in the vessels adapted to its use, than would the interior route.

"(2) As the boats suited for the lake route would be much heavier, so they would be much more expensive, involving a heavier outlay and interest charges. The dictum of the Engineering News that the days of wooden canal boats are over cannot be accepted. I have every reason to believe that if the barge canal were built, many wooden canal boats suitable to navigate it would be built. But whether wood or steel be used, the cost of boats of either material suitable to navigate the lake would be much greater than the cost of boats of the same

material suitable to navigate the interior canal only. This increase is fairly and reasonably estimated at 50 per cent.

"(3) The cost of insurance on vessels and cargoes using the lake route would be very much greater than on those using the interior route. The dangers of the lake route to a string of towed motorless barges along a lee shore are very well known to lake marine insurance men, and these dangers would, according to them, cause the insurance rates to be at least double the rates for the inland route. This is a very serious and important item. As it is the insurance rates on the lower St. Lawrence that militate so much against this route, so it would be the insurance rates that would militate against the Lake Ontario canal route.

"(4) It does not do to belittle the dangers and delays to fleets of canal boats attempting to navigate Lake Ontario, especially in the spring and fall, when the need of the canal for the transportation of the products of the west is at its highest. During a part of September and most of October and November the prevalence of storms would render the navigation of Lake Ontario by fleets of canal boats exceedingly hazardous, and indeed almost impracticable. After personally navigating this lake for four years and having charge of its harbors and lighthouses and studying its characteristics, I do not hesitate to express the opinion that the delays due to bad weather on this lake route will far more than offset the slower time that boats would make through the interior canal, and especially so at the busy time of the year. This latter would, moreover, have the element of certainty and ability to run on schedule time which would be lacking in the lake route.

"(5) The great argument for a barge canal is not confined to its benefit to through business by any means. Far-sighted and broad-minded canal advocates see in the barge canal greater benefit to the state by building up manufactories and industries of many and varied kinds all through the state along its route than would come from the through business. A barge canal would give to every point along its course nearly all the advantages of a sea port and a lake port, and the development of local commerce and manufactories along its route would, it is believed, be enormous, and this in turn would very greatly benefit the farmers of the state, giving to them local markets for their produce.

"The Lake Ontario route would be vastly inferior in respect to local state benefits to the proposed inland route.

"(6) It hardly does, in the study of the great transportation problems confronting us, to ignore the efforts of Canada to attract commerce. The Welland and St. Lawrence canals are an accomplished fact, and Canada is now building a great breakwater and elevators at Port Colborne, and is building others at Montreal and Quebec, and she has entered into contract with a powerful American organization to deliver through her doors a large amount of commerce during the next ten years, and ships to do the business are now being built. Moreover she is straining every nerve to reduce the difficulties of navigating the lower St. Lawrence and rob it of its terrors, by building numerous lighthouses and fog signal stations. What the end will be no one can tell. It at least is hardly proper to cast aside with a sneer the strenuous efforts of such a splendid country as Canada. It is an unquestionable fact that the barge canal by way of Lake Ontario might play into the hands of Canada while by its interior route it could not. If New York should spend the money required for the canal she should have the accruing advantages and not expend it in such a way as might largely rob her of her commerce. There would be little difference in the cost of maintenance of the canal by either route for it must be remembered that by the interior route proposed at least two-thirds of the way from Albany to Buffalo will be in natural water courses on which the cost of maintenance would be very small. The extra cost of maintaining the inland route in some respects will be made up by the extra cost of the lake route in other respects, particularly in operating the additional locks required, for there will be about 270 ft. more of lockage by the lake than by the inland route, and by the cost of maintaining harbors and mooring stations."

"The article in the News concludes by saying: 'The proposed 1,000-ton barge canal is a huge experiment. If it is to have a trial let it be a fair one.' It is hard to see how any business venture could be less of an experiment than this canal would be, but assuming that it is an experiment, I echo the sentiment that it should be a fair one. And to be a fair experiment I venture to suggest that the route by which it is built should be selected by friends who have given the subject careful and long continued study and desire its success, and not by its enemies who predict and expect its failure. Personally I am ready to concede now that a barge canal built by the Ontario route would be a failure for it is so handicapped by natural conditions that it could never reduce the cost of transportation sufficiently to enable it to compete with the existing antiquated Erie canal."

Engineering News discusses Maj. Symons article in the following manner:

"Three weeks ago we discussed in this place the revival of the project for a 1,000-ton barge canal, to be built by the state of New York, from the lakes to the Hudson. We then urged that the route via Oswego and Lake Ontario be selected for such a canal, and not the route along the present line of the Erie canal, from Syracuse westward. We print on another page of this issue a contribution by Maj. T. W. Symons, corps of engineers, U. S. A., arguing against the Ontario route and

in favor of the inland route. We hardly need say to our readers that Maj. Symon's opinions in this matter are entitled to great weight. He has made a special study of the problem of water transportation from the lakes to the seaboard for half a dozen years. His report to the chief of engineers in 1897 on this subject was a most able contribution to engineering literature. He later served as a member of Gov. Roosevelt's canal advisory commission of 1899, which recommended the construction of a 1,000-ton barge canal, for which surveys were made in 1900. He was also a member of the board of advisory engineers, organized in connection with the barge canal surveys of 1900. Further than this, Maj. Symons, if we mistake not, is really the originator of the barge canal project. It was in his 1897 report that the large barge canal was first advocated as the most economical waterway from the lakes to the seaboard. The Roosevelt advisory commission two years later practically adopted this plan, only reducing the size of the vessels to be accommodated to 1,000 tons in place of the 1,500 tons originally proposed by Maj. Symons.

"Certainly then, Maj. Symons' views on this subject are deserving of careful consideration, and we take pleasure in giving space to them, notwithstanding the fact that they are diametrically opposed to the opinion which we expressed and still hold. In considering Maj. Symons' brief against the Ontario route, attention is attracted particularly by his conclusion, in which he declares with emphasis that a barge canal built by the Ontario route would be a failure. If this is the case, why was it not stated in the report of the state engineer upon the canal surveys? This report was prepared in consultation with a board of eminent engineers, of which Maj. Symons was a member. The respective advantages of the Ontario and inland routes were described in the report; but especial care was taken to refrain from recommending one over the other. The plain inference to be drawn from the report was that either route was available for the construction of a successful barge canal. If the Ontario route is so hopeless a proposition as Maj. Symons thinks, the engineer should have made a definite report against it. As they did not do so, it seems fair to conclude at least that a difference of opinion existed in the board as to the commercial advantages of the rival routes.

"We call attention to this, not at all by way of criticism, but to illustrate what we believe to be the fact: that the question which route is the preferable is one on which experts are by no means agreed. Nor is this at all strange. We are taking a look into the future—estimating what business conditions will obtain half a dozen years hence, and what type of water transportation will be most efficient in a waterway now non-existent, and the like of which has never been made.

"To illustrate: Maj. Symons has frequently set forth in his various reports the proposition that for most economical carriage different types of vessels should be employed on the canal, the lake and the ocean. This is all true in the abstract, and yet the raising of transfer rates by elevator combinations at Buffalo or New York might make a type of vessel which could go from the upper lakes to European ports without breaking bulk the preferable vessel to use. Or, again, Maj. Symons has laid much emphasis on the great difference in the cost of a canal barge and a lake or ocean steamer. Yet at a time when ocean steamers or lake steamers are tied up for lack of other business, or when a great rush of traffic brings every available vessel into service, a canal, if one of sufficient size were available, might be used by great numbers of the larger vessels.

"It is not our purpose to discuss seriatim the points raised by Maj. Symons. Instead of discussing further these controverted questions, we want to present the matter from quite a different point of view:

"The cost of the inland route favored by Maj. Symons is \$70,323,000, and the cost of the Ontario route is a little less than \$50,000,000. Manifestly the state ought not to spend this additional \$20,000,000 if \$50,000,000 will accomplish practically the same results. Whether it will or not, is a matter on which opinions differ, and what we wish to suggest is, *why not try the cheaper route first?*

"One particular reason why the less costly route ought to be tried first is that the larger the cost of the project adopted, the smaller is the chance that the voters of the state can be induced to favor it. If the friends of the barge canal project really desire its success they ought to deeply ponder this fact. Turning to the report on the barge canal surveys, we find that the state can build a waterway from the Hudson to Lake Ontario, at Oswego, to accommodate 1,000-ton barges, for \$40,300,000, in round numbers. If the state would do this, then barges could load at Buffalo, pass over to Port Colborne, descend the Welland canal, and sail eastward to Oswego, and thence through the canal to the Hudson, and the whole trip would take no longer time than would be required for passage through the \$70,000,000 inland route, which Maj. Symons favors. If desired the state could assume the payment of the Welland canal tolls in order to give this route an entirely fair trial. If it were found by this trial that the route was a success, the construction of the 1,000-ton barge canal from Erie to Ontario on the American side could then be proceeded with.

"Let us suppose, however, that Maj. Symons is right in his opinion that vessels adapted to navigation both the canal and Lake Ontario cannot be made a commercial success; and that this is proved by actual experience when the canal to Lake Ontario is completed and opened to navigation. Parenthetically

we may remark that it is doubtful if it can be proved in any other way than by actual test. If this situation develops so that the interior route is then found to be essential to the success of the canal, the state can simply proceed to construct the line from Syracuse to Buffalo, and it would then have the canal which Maj. Symons advocates and would have spent nothing additional save the cost of building a 1,000-ton barge canal in place of the present Oswego canal (about \$5,000,000, according to the engineer's estimates). This cannot be considered a loss either, for if the 1,000-ton barge canal can do all that is claimed for it, the small additional cost of the branch to Lake Ontario would be money well expended. In fact, the canal plank adopted by the republican state convention last week calls for the improvement of both the Erie and the Oswego canals on the same lines.

"To put the matter in another way: The state is asked to spend \$70,000,000 to build a canal across it from east to west, and \$30,000,000 of that sum is to be spent on the route from Syracuse westward, parallel and not far from Lake Ontario. Why not postpone building this part of the route until a trial can be made of the waterway which nature has provided?

"And now we want to call attention to another alternative open to the state, and one which we believe is still more preferable to the \$70,000,000 barge canal on the interior route, advocated by Maj. Symons. Careful reading of his paper in another column will show that his objection to the Ontario route is that canal barges would have to navigate the lake. Now let us meet this objection by giving the lake vessels access to Lake Ontario: make Oswego their terminus instead of Buffalo, and let the 1,000-ton canal barges take on their load there.

"But, it will be said, is this practicable within reasonable limits of cost. It is perfectly practicable. No one need guess on this matter now, as was necessary a few years ago. At an expense of nearly half a million dollars the United States has made complete surveys and estimates for a waterway 21 ft. deep, sufficient to accommodate any vessel on the lakes, and probably three-fourths of the merchant shipping of the ocean, the waterway to extend from Lake Erie via Lake Ontario to tidewater at New York. The portion of this survey to which we would now direct attention is that for a canal from Lake Erie to Lake Ontario. Its estimated cost is \$42,000,000 in round figures. As we saw above, the cost of a 1,000-ton barge canal from Lake Ontario to the Hudson is \$40,000,000, making \$82,000,000 for the whole work which we now propose. In other words, for only \$12,000,000 more than the estimated cost of a barge canal by the interior route the state can not only secure the 1,000-ton barge canal from the lakes to tidewater, but it can give the entire lake fleet access to the ports of Lake Ontario. The benefits this would bestow on Ogdensburg, Oswego and the other ports on the south shore of Lake Ontario, and, indeed, upon the entire northern part of the state of New York, are too obvious to call for proof. If the state can afford \$70,000,000 for the inland barge canal, it can well afford \$12,000,000 more to have a Niagara ship canal besides.

"And now we want to call attention to still another alternative. We do not believe it is even necessary for New York to expend this \$12,000,000 additional to secure this great benefit. If she would offer to pay half the cost of a Niagara ship canal, there can be no doubt that congress would undertake to bear the remaining half, particularly if New York couple with it an agreement to build a 1,000-ton barge canal from Lake Ontario to tidewater. This would make the total expense to New York only \$61,000,000—or \$9,000,000 less than the cost of the inland canal route. We will even go farther and say that if New York will build the barge canal alone, congress would almost certainly vote the entire amount required to build the Niagara ship canal.

"The fact is that the matter of cheap transportation to the seaboard is more important to the states of the northwest than it is to New York. Representatives from all these states would surely unite with New York, New Jersey and New England in favoring such an enterprise, and such a combination includes much more than half the membership of the house of representatives. Here is the apportionment of representatives to the several states which would be sure to favor such a measure:

New York	37	Michigan	12
New Jersey	10	Minnesota	9
Pennsylvania	32	Iowa	11
New England	29	Dakota	4
Ohio	21		
Indiana	13	Total	214
Illinois	25	Total membership of	
Wisconsin	11	House	386

"But we need not stop here. If New York is willing to spend from \$40,000,000 to \$70,000,000 to build a canal 12 ft. deep across her territory, she ought to be willing to contribute an equal amount toward the construction of a canal 21 ft. deep from the lakes to the seaboard, passing all the way across her territory; and if she would do that, there is every reason to believe that congress would be willing to furnish the balance of the \$200,000,000 estimated as necessary for this great work.

"We are well aware that there is a general impression abroad that a ship canal from the lakes to tidewater is an impossibility. It has even been said that if such a canal were built it would be used chiefly by barges, such as are proposed for use on the smaller waterway now proposed. This idea has grown largely out of the first plans for deep waterways from the lakes eastward, which proposed a channel deep enough to take the largest ocean vessels. Such projects were indeed chimerical. It is *not* prac-

ticable—commercially speaking—to take such ocean vessels to the lakes. It is practicable to bring the large vessels to the seaboard; and here is where they all would come during the winter season when the lakes are closed to navigation, were a channel once provided.

"We cannot take space at this time to draw the contrast in detail between the barge canal and the deep waterway proposition—the 12-ft. channel and the 21-ft. channel. We cannot refrain, however, from showing the contrast in speed of transit. The official estimates for the sailing time from Buffalo to the Hudson river are, by the barge canal, 4 days, 13 hours; by the deep waterway, 2 days and 4 hours. The commercial value of this increased rate of speed in enabling the waterway to compete effectively with rail lines can hardly be overestimated. Such a waterway could compete with the railway in moving the highest class of goods, and even in passenger traffic. The barge canal, on the other hand, is designed chiefly for the lowest class of bulk freights.

"Finally, we may say, that we do not at all expect that our suggestions will meet with approval from the chief promoters of the barge canal proposition. While many men among its adherents are working in entire good faith, for the public welfare, the most active promoters of the barge canal are those interested in the transfer at New York and Buffalo. They want the cost of transportation reduced so that a larger margin will be left for transfer tolls at each end of the canal route. Buffalo has been induced to give its support to the barge canal project only because it believed with Maj. Symons that the canal barges could not navigate the lake, and would have to take on their load at Buffalo. New York would oppose a ship canal for fear some vessel might sail past without stopping in its harbor. Yet both these cities, and especially the latter, are great enough and prosperous enough to look at the question from a broader standpoint. Nothing is better established than that it is a slow process to change established channels of trade. With Buffalo's railway connections, magnificent terminal facilities and vast extent of manufactures her future is sufficiently ensured. As for New York—for every ton of freight that would pass her doors without stopping, a dozen additional would be delivered at her wharves, were she made the terminus of a deep waterway from the lakes.

"We need hardly say to our readers that Engineering News has been extremely conservative in its treatment of waterway projects. We have presented many times evidence to show that the day of the artificial canal as a competitor of the railway is past. We favor the project for joining the lakes to the Hudson because it is not a canal, in the usual meaning of that term, which is proposed, but a link to connect two great systems of water transportation which now carry a vast commerce. Its traffic, therefore, is assured, and its benefits would not be confined to any special locality or interest. Its construction by state or national funds would be fully justified, therefore, because of the wide range of territory and great population which would receive its benefits."

IMPROVING THE PORT OF LONDON.

There seems to be some prospect of remedying the deficiencies of the port of London. Urged thereto by a requisition signed by the Rothschilds, J. P. Morgan & Co., the Atlantic Transport Co. and the Barings, the lord mayor of London has summoned a conference to take place at the Mansion House on Oct. 27, with the object of laying before the government some practicable measure for the improvement of the port. Among the proposals which are attracting attention is the abandonment of the present dock and wharf system, on which the recent dock commission proposed to spend \$140,000,000, and convert 6 or 7 miles of the river into a vast tidal dock, furnishing ample room for all kinds of craft.

Up to the year 1881, the Peninsular & Oriental Co. made Southampton its home port, and that, owing to the inadequacy of the accommodation, the venue was changed to London. In the intervening period of twenty years the Hampshire port has, however, made such remarkable progress that it is now considered to offer advantages wholly superior to those available in the river Thames, and hence it is proposed that the company shall return to Southampton. In November, 1900, it was publicly intimated by Sir Thomas Sutherland that vessels were under construction for the P. & O. Co. which could not enter the Albert, and that the alternative was to send them either to Tilbury or to Southampton. Simultaneously the chairman of the P. & O. Co. complained that, owing to the limited depth of water in the river, a vessel prevented from entering the Albert dock, through any untoward event, might be compelled to steam all the way back to Gravesend for a safe anchorage. A guiding consideration in the construction of the ships of the P. & O. Co. is the draught of water in the Suez canal. The deepening of that waterway is steadily proceeding, and represents an improvement in the last few years of at least 3 ft. or 4 ft.

The advantages of such a simple change as proposed are many. The journey up and down river is shortened by 2 miles, a matter of no little consequence at a point where the traffic is so crowded. The tide will run better and scour the channel more effectively, thus saving much expense in dredging. At present, while the tide meanders slowly around the great horseshoe bend at Greenwich it deposits so much silt that vessels are frequently delayed in the channel at low water. On the

other hand, the change would not only improve and shorten the navigable channel, it would provide the whole space of the 3 miles of river now forming the bend for dock and wharf accommodation. Something like 5 miles of wharfage suitable for vessels of any size would be created, so that the difficulty of the Peninsular & Oriental Co. would at once be removed. This deficiency of wharfage is one of the chief grievances of ship owners against the port. At present a vessel must go to one point to discharge hides, to another with tobacco, and so on, because there is not wharf space to unload the whole of a general cargo and sort it out on the banks. So the ship must be warped about from point to point with an infinity of labor and a ridiculous amount of delay, while with ample wharf space she could unload at once and get a quick discharge. To ship owners time in these matters is golden. A further point would be the ease with which vessels would be brought alongside the wharves. Warping ships around corners and in and out of narrow passages by hauling at them with ropes is a tedious process, but the proposed scheme would enable a ship to be towed into the new tidal basin at high tide and taken by a tug alongside her berth without difficulty.

One great feature of the scheme would be that it would give this enormous addition of wharf accommodation right in the heart of London. Tilbury and the Royal Albert docks are so far away that the haulage and the discharge of cargo cost as much as conveyance from Calcutta. The port of London which by this simple change become at once one of the finest in the world. And full advantage of the existing railway communications would be taken, which could not be the case if vessels discharged at Gravesend or Tilbury. Mechanical objections there are practically none. Parliament would have, of course, to prevent the overloading of the scheme by bogus claims, and to enable the public authority to take over the shore at a price fairly representing its value to the present owners.

The whole work could be completed in two years, and the matter is so urgent that it is well worth the while of the special committee of the corporation and of the London county council to consider whether the board of trade should be pressed to bring in a bill authorizing the immediate commencement of the work, during the long and complex process of the handing over of the docks to a public authority.

WORK ON MARE ISLAND DRY DOCK.

San Francisco, Oct. 12.—The new government dry dock in course of construction at Mare Island, when completed, will be the largest on the coast with capacity for docking the largest battleship, or several smaller vessels at once. The excavation, piling and caisson are completed. Pumping out is to be begun shortly. At the navy yard, dismantled and being repaired, are the small gun boats, Concord and Petrel, which did such effective work as a part of Dewey's fleet at Manila. The Marblehead, (lake built), also the Bennington, are being extensively overhauled. The Solace, formerly the Creole, belonging to the navy department, is used for carrying stores and passengers to Manila and Guam, making an occasional trip to Samoa. She is a speedy and popular steamer. A new electric plant is being installed and extensive renewals are being made in the Solace. Extensive repairs have been made in the equipment of the Mare island plant which amount to a rebuild in many instances. Capt. Lew. Vance, formerly of Milwaukee, has charge of a department at the yard, handling all the coal anchors, chains and shipchandler supplies. He has caused a Brown hoist to be installed to handle the coal, and two lighters to be constructed.

An interesting, and somewhat important point, has just been settled by the United States circuit court. It is to the effect that the crew of a vessel under articles for wages can become general salvors only after the vessel has become a shipwreck without hope of recovery and the crew discharged. The court decided that the libel on this score against the steamer C. F. Bielman should be dismissed. The libelants in the case were James Galbraith, John Weimar and William Bachelor. The Bielman, bound from Buffalo to Milwaukee with a cargo of coal, lodged on a shoal 2½ miles from shore and 15 miles from Milwaukee. The crew, sixteen in number, were under articles to make the round trip at fixed wages. The steamer struck late in the evening of Sept. 17, 1900, and the crew under the direction of the captain began to shovel the coal overboard the next day. After two days work the steamer floated off the shoal and was taken to Milwaukee. Three members of the crew afterward presented their claim for pay as special salvors. Judge Grosscup in delivering the opinion said: "What appellants did was plainly within their duty as seamen and was therefore paid for by the wages stipulated in the articles of employment."

Gage records of the United States lake survey show the following mean stages of water for September, above mean sea level: Lake Superior, 602.37 ft.; Lakes Huron and Michigan, 580.06 ft.; and Lake Erie, 572.47 ft. These stages show Lake Superior to have been 0.11 ft. lower than during same month last year and 0.16 ft. lower than in September, 1895; Lakes Huron and Michigan 0.38 ft. lower than during same month last year and 0.67 ft. higher than in September, 1895; Lake Erie 0.67 ft. higher than during same month last year and 1.1 ft. higher than in September, 1895.

BOILERS.

From the Naval Annual.

The past year has been characterized by a persistent discussion in naval engineering circles, and in the technical press, as to the relative merits of the various types of water-tube boilers in use in the navies of the world, and, to a much more limited extent, and more especially in England, to the relative merits of water-tube and cylindrical boilers. In most navies the cylindrical boiler seems to have been definitely and entirely abandoned, except in partial installation in large vessels in conjunction with water-tube boilers. This compromise arrangement has found much favor in Germany and has been used in Holland, and is to be tested by the British admiralty. The numerous tactical and constructional advantages of the water-tube boiler over the cylindrical have been so often stated that it would be superfluous to enumerate them here. There is a conservative element in Great Britain that has consistently upheld the cause of the cylindrical boiler for use in the British service, and these took much heart from the result of the Hyacinth-Minerva trials last summer. But as to actually settling the vexed question the results of these famous trials would appear to be unsatisfactory, for, though they showed that the Scotch boilers of the Minerva were superior to the Hyacinth's Bellevilles, the tests did not prove that the Scotch boiler is superior to other types of water-tube boilers, but simply seemed to confirm what the previous trials had shown—the special faults and deficiencies of the Belleville generator.

Of course a section of the English and the continental technical press, and world, did not accept, without much protest, these results, and made claim that much of the lack of success with Belleville boilers in the British service was due to unskillful care and operation by the personnel. That there may be ground for this claim is shown by more successful experiences with Bellevilles in other British vessels, and particularly in the trials of the new cruiser Good Hope, though it has by this become well known from sad experience that the performances of a vessel's boilers during trial trips, even of an extended nature, are no criterion of their subsequent behavior under service conditions.

France, Italy, and other naval powers have been using Bellevilles with satisfactory results during the past few years. While the British admiralty were evidently justified, from the evidence before them, in condemning the exclusive, or even extended, use of the Belleville in their service, the engineering world in general feels that further exhaustive and long-lasting trials in competition with other water-tube boilers are essential before this system can be definitely condemned or placed in its proper position in a relative scale of merit of the various types. Germany and Italy have both engaged in such tests, accounts of which are given further along in these notes, and Great Britain is now, as befits the much greater size of her navy and her vital interest in such matters, about to carry out comparative trials upon the largest scale yet undertaken. The results of these trials will be watched with the very greatest interest, for the problem is still very indefinite, and the net results of investigation to date force us to the conclusion that though the water-tube boilers are superior, indeed essential, for our new vessels, yet each of the types in use has its own special defects and disadvantages. The problem would appear to be to find the boiler that has the least of such faults, or, better yet, to set about eliminating them in the present systems, or to discover an entirely new type that shall be free from them.

Water-tube boilers may be divided into two general classes—small tube and large tube. There has been controversy during the past year as to the relative merits of the two types for use in large vessels. In the small-tube type we have straight or bent tubes of an inch or so in diameter connecting water pockets at the bottom to a cylindrical steam drum at the top. This type has been almost universally used in all navies for launches, torpedo boats, destroyers, in many gun boats, and in small cruisers, and in France, Germany, and some of the smaller navies to a greater or less extent in large vessels. The Yarrow, Thornycroft, Thornycroft-Schultz, Norman, Normand-Sigandy, Normand, and Guyot, are the principal boilers of this type. The smaller tube boiler first came to life about twenty-five years ago, owing to the demand then for higher speeds in torpedo boats. It is a very light boiler, which can be forced to an extent that other steam generators can not. It has practically enabled the modern torpedo boat destroyers to attain their great speeds; but the life of the boiler is very short, the repairs required very great, and the skill in handling very considerable. These sacrifices are only what can be expected from a boiler designed to drive such frail craft as destroyers. Their average life is about two or three years in such racking service, but there are several new boats lying in the dock yard reserves that have had to have their boilers retubed in spite of only having recently been built, and never having steamed except on their trials. This is due to the decay that goes on inside the tube while the boilers are idle, and as the tubes are very thin they consequently can not afford to lose very much in thickness.

The general tendency lately has been toward the elimination of the small tube boiler for large vessels, owing to the

known difficulties in cleaning them and to dangers in operation. However the French and German admiralities have by no means entirely abandoned them, though there have been a series of most unfortunate catastrophes and failures with small tube boilers in both services during the past year. The distinctly adverse opinion of the British boiler committee with regard to this class of generators in large vessels was a decided setback for the type.

The large tube boilers, now the subject of so much controversy, consists essentially of a group of more or less inclined straight tubes which are jointed to a single or series of vertical collectors, which connect a water collector at the bottom to a cylindrical steam drum at the top. The tubes are single, of the ordinary type, as in the Babcock-Wilcox or Belleville, or of the double or Field type, as in the Niclausse or Durr. These four are the leading types of large tube boilers and are those with which the principal experiments are now being conducted abroad. The new type of Yarrow boiler which has found favor in Holland and Austria might be said to be a compromise, for, while it retains the general constructional arrangement of the small tube type, its tubes have been made much larger than formerly.

Following will be found notes upon the system of boiler installations in the principal navies with recent experiences in operations and trials. The South American powers, which possess a number of large and important vessels, have in every case had them constructed in British or European ship yards and have adopted the particular type of generator most in favor at the various ship yards, so they have formed no consistent naval boiler policy.

AUSTRIA.

After making rather unsuccessful trials in the Lussin with the earlier type of Durr boiler, the Austrian government adopted the Belleville and Yarrow boiler, and at present they seem to be about equal as to preference.

DENMARK.

This government has installed the Thornycroft small tube boiler in its new coast defense ironclads, following the result of an installation of eight boilers of this type in 1898 in the small cruiser Geiser.

FRANCE.

The French admiralty have passed through a year of much doubt and uncertainty in regard to boilers, and nowhere has the question of small versus large generators raged more furiously. Almost the first to install the water-tube boiler, France has for a number of years committed herself absolutely to the type. As a consequence we have more types originating in France than any other country, and the French navy has made trial of five systems. These are Belleville, Lagrafel-d'Allest, Niclausse, Guyot, and Normand-Sigandy.

The Lagrafel-d'Allest, a straight inclined-tube boiler, the tubes being dudgeoned into large single headers at front and rear, was early condemned in consequence of a serious accident with this type on the Jaurequiberry, and because of the great care required in working them. Before their abandonment, however, they were fitted into a number of important French vessels.

The Belleville and Niclausse boilers have been very extensively used. The former, having been on the market for a longer time, has a greater total of indicated horse power in use than the latter. Recently the orders are about evenly distributed between them. One hears very little complaint from French naval engineers as to their operation, and in fact, considerable praise as to the ease with which they may be cleaned, cared for, and repaired.

The Guyot and Normand-Sigandy boilers of the small-tube type have been installed in a number of French vessels, including some of the largest and most important cruisers in the service. Among others are the Jeanne d'Arc, Chateau-Renault, Montcalm, and Jurien de la Graviere. These vessels during the past year have undergone an unfortunate series of trials and mishaps, which have done much to destroy faith in the small tube boiler.

The Chateau-Renault had her trial last August, at which time she obtained, in a three-hour trial, the splendid speed of 24.2 knots.

As far as can be learned, during this trial the boilers functioned satisfactorily, and the faults developed were all in the engine room. During a six-hour trial this vessel developed 18,500 H. P. at 118 revolutions, giving a speed of 21.5 knots, with a coal consumption of 1,423 lbs. per horse power hour. These results are excellent.

The Jeanne d'Arc was taken out for her first trials the latter part of July. This 11,000-ton cruiser has Guyot boilers designed to furnish 28,500 H. P. for 23 knots speed. Twenty-four out of the thirty boilers were started up. Almost at the beginning it was found that coal could not be directly thrown into the furnaces, but must be put in from one side. The temperature in the fire rooms rose to 155° F. The water feed began to fail and the boilers became red hot. The fire-room force abandoned the stokeholes in a panic, fearing an awful catastrophe, and they were only driven back in order to draw fires in six of the boilers which were at a red heat, and fourteen in which the water level has disappeared. With the remaining four boilers the vessel crawled back into port at a speed of 2 to 3 knots. In consequence of this accident the installation is being extensively overhauled, and the vessel will

probably not be ready for her final trial before the coming summer. For the same reason the Jurien de la Graviere and Montcalm have also undergone extensive modifications in their boilers. In her own trials the Montcalm experienced the same excessive temperature in the stokeholes.

GERMANY.

The German authorities are strongly actuated by patriotic motives in their selection of the Durr and Thornycroft-Schultz (or, as they prefer to call it, Schultz) boilers, as both these are of German manufacture. Actually the Durr boiler closely resembles the Niclausse, and while it possesses most of the advantages of that boiler, it is claimed by French and British marine engineers to possess certain additional disadvantages. The Schultz boiler is simply a slight modification of the Thornycroft type, and in fact they are now consolidated under the double name.

This latter type of generator has been unfortunate in one or two cases during the past year. On the Ariadne in one of her boilers sixty tubes were damaged badly, thirty-nine of them having their ends torn loose from the drum, the other twenty-one being much twisted. Two men were killed and four injured in the explosion. Later, on the coast defense ship Aegir while bound out from Kiel, a number of tubes split suddenly, and a burst of flame came out into the fire room, burning badly three petty officers and two firemen.

ITALY.

The Italian navy has confined itself to two types of water-tube boilers, both French—the Niclausse and Belleville—for the new vessels now building, the number of installations being about equally divided. Italy has been conservative in regard to the water-tube boiler, and few finished vessels in her service have them installed. That the Italian admiralty is desirous of determining a single type to be adopted is shown by the comparative trials of the Niclausse boilers in the Garibaldi and Bellevilles in the sister ship Varese. A board of officers, with a rear-admiral of the Italian navy as president, conducted the experiments. Both ships were placed under exactly the same condition with reference to the cleanliness of their bottoms, trim, and other features, the ships being of the same tonnage. It was intended that there should be continuous trials for twenty-four hours, along the route from Naples to Augusta. The results show that the two types of boilers are practically the same except in regard to the consumption of coal per horse power hour and for the consumption of water. The data of the trials are as follows:

Data.	Garibaldi (Niclausse).	Varese (Belleville).
Duration of trials—hours	24.	24.
Average speed—knots	17.05	16.04
Distance steamed—knots	412.	392.2
Mean draught at beginning—feet	24.1	24.4
Corresponding displacement—tons	7,763.	7,940.
Number of boilers, main engine.....	16.	16.
Boilers for auxiliaries	(A)	4.
Total grate surface, boilers for main engines, sq. mtr.	67.52	64.12
Total heating surface, boilers for main en- gines—sq. mtr.	2,821.12	2,077.16
Total heating surface, boilers for main en- gines, sq. mtr., mean indicated horse power	6,815.48	6,386.60
Coal, per square meter of grate per hour— kilograms	86.88	78.79
Coal per horse power per hour	1.89	1.76
Horse power per square meter of grate....	100.94	99.60
Horse power per square meter of heating surface	3.12	3.074
Total coal, per horse power-hour, including auxiliaries—pounds	2.082	1.94
Approximate consumption of water during trials — tons	14.900	20.030

(A) Four for first and two for rest of trial.

Some of the tubes in both Niclausse and Belleville boilers were found to be indented with fine cracks varying to a maximum of from 14 to 15 millimeters. These slight cracks did not require the tubes to be replaced nor any special repairs. The board reported that after the trials all the boilers were in good condition for any service. The conclusion was arrived at that in the twenty-four-hour trial the Belleville and Niclausse boilers fulfilled all the requirements of regular service, both giving practically identical results. It is interesting to note, in view of the complaints in this respect of the Bellevilles in the Hyacinth during the vessel's Gibraltar run, the much greater consumption of fresh water of the Bellevilles than the Niclausse.

JAPAN.

The Japanese authorities have always clearly followed in every respect the British admiralty and most of their larger vessels have been built in British ship yards. Thus, with the extensive adoption of Bellevilles by the British, Japan followed their example. Lately they have begun to install Niclausse, the cruisers Nutaka, Tsushima, and Yaeyama being thus fitted. This progressive power, though, is not entirely content to use foreign installation and now is fitting in the Hashidate, of 4,278 tons displacement, eight water-tube boilers of a new type, invented by a Mr. Miyahara, a Japanese. This boiler has

been used in some mercantile steamers and has been found very successful, but its employment in a man-of-war will commence with the Hashidate. As this vessel's sister ships are fitted with Bellevilles, a good opportunity will be afforded for comparative trials. For small cruisers the Japanese authorities have made use of the Thornycroft and Normand types, but have not extended their use in larger units.

NETHERLANDS.

This country has recently entered upon a more extensive building program and in doing so was, of course, confronted by the inevitable question of boilers. In their series of present cruisers the first three were built with a compromise installation of three-fourths Yarrow and one-fourth cylindrical boilers (for ordinary speeds). The Yarrow seems to have given satisfaction, for the later cruisers of this series were fitted with the Yarrow exclusively, as have been the new ironclads under construction. These boilers are of the large tube Yarrow type.

NORWAY AND SWEDEN.

The Yarrow boiler has been adopted for the new vessels of these countries. A trial installation of the Babcock & Wilcox type was made in the Norwegian corvette Ellida.

RUSSIA.

The Russian navy, following in this question the British navy, at first adopted the Belleville, and there are a number of large vessels equipped with this type. Lately, in consequence of some experiments on the gun boat Herbry, the Niclausse system was adopted for the Variag and Retvisan, and the results of these vessels' trial were successful. Finally it has placed Thornycroft-Schultz and Normand boilers on two large cruisers. It is most likely that the latter resolution was taken in order to make comparisons between the apparatus generally in use now. In connection with this idea Russia has had recently launched from a German ship yard the large collier and training ship for firemen, Okean. This vessel has a boiler installation comprising four different types, distributed as follows:—Six Belleville boilers, six Niclausse three Yarrow, and two Thornycroft-Schultz. The engines are to develop 18 knots with 11,000 I.H.P. This novel vessel should prove very useful in the instruction of the fire room personnel of the Russian service as well as in affording an opportunity for comparing the operation and economy of the types installed. Russia has had partial success with Thornycroft-Schultz boilers as installed in the Askold, which, during her trials, had more than 900 tubes burned out on one trip and was not able to make her contract speed.

SPAIN.

The Spanish navy is now building no new vessels. It has some large vessels still uncompleted on its hands, which were laid down several years ago. It is not easy to determine its preference. It is placing Belleville in the Rena Regente, the last vessel on the stocks. The Pelayo and the ill-fated Colon were fitted with Niclausse. The cruiser Rio de la Plata is fitted with Normand-Sigandy boilers. An article on the means employed in their care and preservation on this vessel in the Revista General de Marina for August, 1901, tells us that these boilers were run for fifteen months for a cruise of 24,000 miles without an accident or a plugged tube. Though it is evident that special care was taken and no high speeds demanded in their case, it shows well for the generally condemned small tube boiler type. The new Estramadura is being fitted with Thornycroft-Schultz boilers.

GREAT BRITAIN.

This, the most important naval power, has been left to the last for discussion, because its tests and trials have been so much more extended, more thorough, and more conclusive than those of any other nation that they will best serve as a summation of the perplexing question as it stands to-day. A careful perusal of the report of the admiralty boiler committee and a thorough and impartial reading of the voluminous editorial and articles, partial and impartial, that have appeared in the British and foreign technical and general press during the year past, can not but lead to the conclusion that we have made little progress toward the solution of the problem, except it to be the impulse or pressure that has led the British admiralty to order a large and varied comparative installation of water-tube boilers in large units. The tests of boilers of various types in destroyers and small gunboats have been interesting and have given us some valuable data, but they have not been conclusive. Most engineering men are satisfied in their minds as to the desirability of some type of small tube boiler for very fast small craft, just which type being a matter of local opinion and minor consideration. But they are by no means satisfied as to the proper generator of energy for the vital units of the fleets, those upon which the fate of the nation depends primarily, the large battleships and armored cruisers and "commerce destroyers," that all navies are laying down, and in which so many thousands of horse power are required, and whose boilers represent vast sums of money not to be thoughtlessly expended for this or that preference of the moment, or, when once installed, not easily changed except at great trouble and cost. This is the question which is engrossing the engineering mind today, and if the British admiralty's tests but solve it they will have conferred a most valuable benefit not only upon their own service but upon all the navies, whose officers are following with keen interest the development of the problem.

PRIVATE AND GOVERNMENT BUILT BATTLESHIPS.

Labor is deeply interested in the competition between the government and the Newport News Ship Building & Dry Dock Co. as to which can build a battleship better, cheaper and quicker. The question cannot be settled until 1906 when the two vessels should be ready for sea. The ship building company starts with the advantage of a complete plant and trained labor. On the other hand the Brooklyn navy yard began the preparatory work upon the battleship Connecticut last July. About \$175,000 is being spent in putting the navy yard in shape to build the battleship.

Admiral Bowles, chief constructor, and other naval experts, contend that the cost of the government-built ship will be 25 per cent. greater than that built by private contract. The contract price of the Louisiana is \$3,990,000 exclusive of armor and armament which would make their estimate of the Connecticut's cost \$4,987,500, or \$997,500 more than for the Louisiana.

Secretary Moody has given instructions which will prevent delay in the construction of the Connecticut, directing co-ordination of work between the several bureaus so that one bureau shall not bring its work to a point where it should be taken over by another bureau only to find the latter unprepared. In the matter of armor Admiral O'Neil, chief of ordnance, had intended to delay issuing advertisements until spring, when the manufacturers would have delivered much of the armor for battleships previously laid down. There was also the possibility that congress might again fix a cost limit, which would result in embarrassment. Finally there was the chance of improvement in armor, and Admiral O'Neil wanted the best that could be obtained. But after discussion Admiral O'Neil is arranging to contract immediately for armor, almost 8,000 tons of which will be required. An indication of the increase in the size of American battleships is given by the amount of armor required.

Battleships of the Maine class, of 12,500 tons displacement, carry 2,451 tons of armor each. The 13,500-ton New Jersey class will be protected by 3,332 tons of armor. The Louisiana and Connecticut, on a displacement of 16,000 tons, require nearly 4,000 tons of armor each. The specifications for this armor demand not only the best armor now on the market, but that the successful contractor shall use every endeavor and incur all necessary expense to keep pace with the highest development of the art. The best thick armor today is that manufactured by the Krupp process. The best thin armor is the Harveyized. Each will be subjected to the usual severe tests. All armor 5 in. or more in thickness will be tested by three projectiles, the guns, with the exception of the 9 and 11-in. armor, being of the same caliber as the thickness of the plate. In the exceptions noted, 8 and 10-in. guns will be used. By making the armor contract immedi-


ately, responsibility for delay will be placed upon the contractors.

This question of time will be an important one. The Newport News company has agreed to deliver the Louisiana in forty-one months, or in March 1, 1906. The Connecticut must also be completed within that time, else the disadvantage of slowness will be charged against government construction. This contingency is not unexpected by the department, which, under the law, cannot employ men more than eight hours daily. Ship builders can and do make their day longer. Nevertheless, though the department did not favor government construction, it proposes to devote every energy to making the Connecticut as good a ship as possible, with as much rapidity and as cheaply as circumstances will permit.

But four vessels of the new navy have been built by the government, the Texas, the old Maine, the Cincinnati and the Raleigh. All have seen splendid service, yet all could have been constructed more quickly and more cheaply by private contract. At the present time, when peace can be assured only by an adequate navy, delay in construction is deplored by naval officers; but in building ships at navy yards the United States is doing what Europe has done for years. During the present year France has laid down battleships, armored cruisers and smaller vessels in her navy yards. Germany is building in her yards two battleships, three armored cruisers, one protected cruiser and one gunboat. Seven battleships, nine armored cruisers and six gunboats are being built by the British government in its own yards. Russia, Austria, Italy and other nations are building ships themselves. In addition all are obtaining contract built ships, the policy being to employ labor and at the same time to keep the private yards busy. This is the policy labor desires the United States to adopt.

Mr. Sidney Boulton, well-known underwriter at Lloyd's, is combining some business with a pleasure trip to the United States that will probably extend over a couple of months. He spent several days on the great lakes. Mr. Boulton has for some time past been a leader among underwriters at Lloyd's who engage in lake business. The number of lake policies bearing his name is very large but still probably not more than a hundredth part of his general business, as he is a large operator in insurance. He was very frank in saying to vessel men, representatives of insurance companies and others whom he met on the lakes that personally he had only a very meager knowledge of the ships, transportation methods, etc., but of course that need not interfere particularly with his success as an underwriter.

A band saw machine and a large wood lathe were recently shipped by the Atlantic Works Incorporated, of Philadelphia, to the Perth Amboy Dry Dock Co., of Perth Amboy, N. J.



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TRADE NOTES.

The pamphlets and catalogues which come from the Fort Wayne Electric Works are always of an excellent character. The latest output advertises the Wood oil transformers, measuring instruments and arc lamps. Each catalogue is thoroughly described and illustrated and will be forwarded to anyone interested.

The Buffalo Forge Co., Buffalo, N. Y., has issued a booklet devoted to the Buffalo down draft stationary and heating forges for industrial works. In its preface it says that its purpose is to show a complete line of the most modern-designed and honestly-built and best-equipped forges on the market. The typical features of the Buffalo down draft forges are completely described and illustrated.

The United States circuit court of appeals has finally put an end to six years of litigation between the owners of patents on the Shaw & Spiegle towing machine and the Chase Machine Co. of Cleveland. The case, which has been argued four times, is again decided in favor of the Chase company. There is no opportunity for further appeal. The court decides that the Chase machine does not infringe.

The Chicago Pneumatic Tool Co. report that owing to the vast amount of business they are receiving from the southwest territory they have deemed it advisable to again place a representative in that district and therefore have located Mr. W. C. Walker in St. Louis, with headquarters at 325 Lincoln Trust building. They believe this arrangement will greatly facilitate handling the large volume of business received from that territory and will be advantageous to both, to themselves and to their customers.

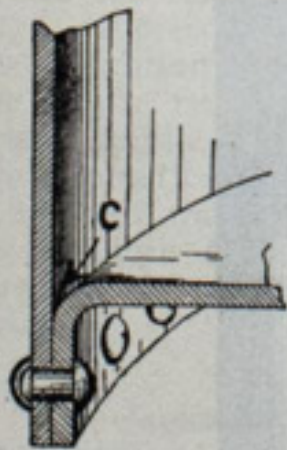
H. I. Crandall & Son Co., well-known dry dock engineers of Boston, are constructing one of their marine railway dry docks of 3,500 tons capacity, at the new ship yard of Hall Bros., Port Blakeley, Wash. The cradle will be 320 ft. long by 76 ft. wide, and will have ample draught of water for any vessel within the capacity of the dock. The frame of the cradle is of steel and is being built by the Boston Steel & Iron Co. of Boston. The cradle will have the usual dock floor, together with other equipments that are a feature of marine railways designed by the Crandall company.

The H. W. Johns-Manville Co., New York, has issued a catalogue, pocket size, devoted to Vulcabeston packing. The increased temperature and pressure in the modern steam plant, necessitated by the strenuous requirements of up-to-date manufacturing interests, have resulted in a complete revolution in the manufacture of steam packing. This revolution Vulcabeston has sought to meet. This packing is adapted for any steam pressure. It does not deteriorate by the action of high pressure or superheated steam. A prominent trunk line railroad has used Vulcabeston concave and convex packing rings for valve stems on both sides of one of their heavy express passenger engines for more than a year, running over 100,000 miles, and each stem traveling 20,000,000 ft. without finding it necessary to even screw down the follower. The rod was not scratched or worn and is perfectly smooth. The pump of the drilling engine in the yards of the Westinghouse Air Brake Co. at Wilmerding, Pa., was packed with similar rings and ran for ten months. A copy of this little catalogue will be sent to anyone upon request.

Articles of incorporation of the Michigan Steel Casting Co. have been filed. The company proposes to build and operate a steel casting plant, rolling mill, brass foundry and gray iron foundry and to do a general iron and steel manufacturing business. The capital stock is \$300,000 with \$30,000 paid in. The shares are held as follows: Karl R. Davies, Fred J. Murtrie and Maxwell R. Davies, each 5,000; Karl R. Davies, trustee, 5,000; Fred J. McMurtrie, trustee, 5,000.

The Struthers Furnace Co. of Cleveland announces removal of their offices Oct. 15, to rooms 1106-1109 Citizen's Bank building, No. 190 Euclid avenue.

REPAIRING LEAKING SEAMS.



Cut showing place in Boiler where Smooth-On Iron Cement No. 1 was successfully used for stopping leaking seam after caulking had proved unsuccessful. A layer of cement was placed at seam C its entire length, so as to make a fillet around the inside of the joint between the head and the shell—allowed to stand twelve hours to metalize—it made the seam perfectly tight.

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ITEMS OF GENERAL INTEREST.

Bids have just been opened in the navy department for the construction of concrete and granite dry dock No. 1 at the Charlestown navy yard. The lowest straight bid was that of the Virginia Engineering & Construction Co. of Richmond, Va. This company offered to complete the dock for \$1,189,450.

The American Ship Building Co. has just paid (Oct. 15) the regular quarterly dividend of $1\frac{3}{4}$ per cent. on preferred stock. Official announcement is made of the company's first dividend on common stock, authorized at a meeting of the board of directors just following the annual meeting of stockholders on the first of the present month. It is expected that this distribution of \$1 per share quarterly will be a regular affair. The first \$1 per share is to be paid Dec. 1. Books close Nov. 17 and reopen Dec. 2.

The first of the five freight steamers, building in this country for the Atlantic Transport Co. was launched this week from the works of the New York Ship Building Co., Camden, N. J. She is 490 ft. 5 in. long, 56 ft. 3 in. beam and 35 ft. deep. Her carrying capacity will be 13,000 tons. She will be christened Massachusetts. Her sisters, building at this yard, will be christened Minnelora and Minnekahta. The two which the Maryland Steel Co., Sparrow's Point, Md., are building will be christened Missouri and Maine.

The financial statement of Canada for the year ending June 30 last has just been issued. The revenue for the year was \$58,024,228, an increase of \$5,509,527 over the previous year. The expenditure was \$50,739,953, an increase of \$3,873,586. The difference between revenue and expenditure, on ordinary account, is shown in a surplus of \$7,284,275; but there was an expenditure of more than \$13,000,000 over capital account. If the surplus and sinking fund payments be deducted from this then there has been added to the public debt for the year \$3,398,412. Canada's net debt is \$271,878,415.

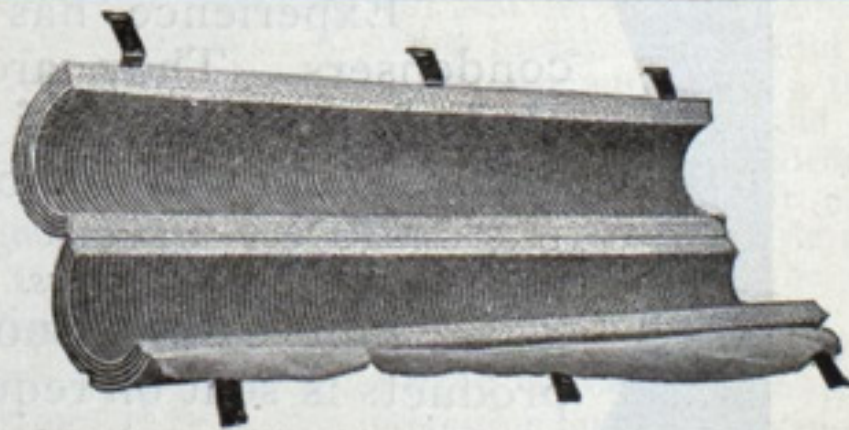
While nothing definite can be learned regarding the improvement of steamship service from Canada it is reported that Sir Wilfred Laurier, premier, has said that the contract for the fast steamship service would be awarded to the Allan-Furness company, and that the service to be established would be a 20-knot service. The contract with the Canadian Pacific was objected to on the ground that no such important contract could possibly be carried out by any one railway without injuring other railways. A prominent director of the Canadian Pacific railway when shown this statement announced that his company would secure at once a number of freight ships and establish a regular service from Montreal and Quebec.

Vessels classed and rated recently by the American bureau of shipping in the Record of American and Foreign Shipping are: American screw steamers Siberia and Finland; American side-wheel steamer Uncatena; American schooners Fred A. Davenport and Star of the Sea; American three-masted schooners Celia F., Frank W. Benedict, George L. Drake, Henrietta J. Powell, Norombega, Joel F. Sheppard, Levi Hart and Belle O'Neil; American barkentine Shawmut; American barge Charles K. Nicholas, American half brig John McDermott; British schooner Ada Mildred; British three-masted schooners Coral Leaf, J. L. Nelson, Lillian Blauvelt, E. Merriam and Zeta.

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